"K W A S H I O R K O R"

O R

"M A L I G N A N T M A L N U T R I T I O N"

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"KWASHIORKOR" or "MALIGNANT MALNUTRITION"

INTRODUCTION.

In 1933, Cecily Williams[1] described a deficiency syndrome found in children on the West Coast of Africa. This syndrome, which was characterized by oedema, diffuse depigmentation and desquamation, angular stomatitis, cheilosis, glossitis, pale and atrophic hair and a grossly fatty liver - was subsequently named KWASHIORKOR[2] or 'Red Boy'. Stannus[3] in 1934 expressed the belief that this disease was Pellagra as it appeared in children in warm climates.

In 1937 a comprehensive account of the syndrome was published by Trowell[4] who, at that time, accepted it as that of infantile pellagra. Later, (1944)[5] he stated that he could no longer consider the condition to be that of pellagra and suggested the term "MALIGNANT MALNUTRITION" for the disease.

Since Kwashiorkor was first described a voluminous literature on the subject has appeared and cases have been reported from many parts of Africa, South and Central America, China and India.

One of the features of this condition was the high mortality rate associated with it, even when skilled treatment was available. Hughes 1946[6], for example, reported deaths over three years as follows:- 1942/3, 58%; 1944, 58%; 1945, 50%; but more recently Altman[7] has reported a mortality of 20% and Trowell[8] one of less than 10%.

The purpose of this Thesis is to record cases of Malignant Malnutrition seen in Luanshya, Northern Rhodesia and to discuss the aetiology, clinical manifestations, pathology and treatment of this condition.

CASE No. 1.

ANOCK. (12584). Male. Age: 14 mths. Tribe: Nsenga.

History.

No past history available.

Health of parents appeared to be good. No other children in the family. The mother was about two months pregnant. Diet of child consisted of breast milk very occasionally supplemented with thin soup and mealie meal porridge. The soup was usually made from bones and vegetables.

Present Condition. 17. 1.48.

The child was brought to the Clinic because of pyrexia and was found to have an acute otitis media. Routine examination shewed oedema of the feet and an enlarged liver. No other abnormality was detected. Malarial parasites were not found in a thick blood film.

Treatment and Progress.

The otitis media responded readily to treatment and the child appeared to be improving. Oedema of the feet persisted, and there was no decrease in the size of the liver.

30. 1.48. Again pyrexial. Malarial parasites found in a thick blood film. (Subtertian Malaria). Malaria responded to treatment with quinine.

10. 2.48. General condition worse. Extra feeding commenced at Clinic. This consisted of about one pint of milk a day and a hot meal of minced meat and vegetables daily. Both the milk and the meat had to be consumed at the Clinic. The child's condition deteriorated steadily, and he died on 17. 2.48.

Post Mortem - 12 hours after death.

Hair abnormally straight and thin. No angular stomatitis, cheilosis or glossitis. Scanty depigmentation of the skin of the perineum, groins and the tops of the thighs. Oedema of the feet. Emaciation of limbs.

The liver was enlarged and almost yellow in colour, and there was slight enlargement of the spleen.

The small intestine appeared to be very thin walled and almost translucent. There was a marked absence of fat in the mesentery.

The lungs shewed broncho-pneumonic patches.
No other abnormalities were noted.

Micros:-

Liver. Gross fatty changes involving every liver cell in the sections studied. Patchy round celled infiltration of portal tracts. No increase in fibrous tissue noted.

Lungs. Congestion. Patchy bronchitis and peri-bronchial consolidation.

Heart. Cellular degenerative changes in myocardium.

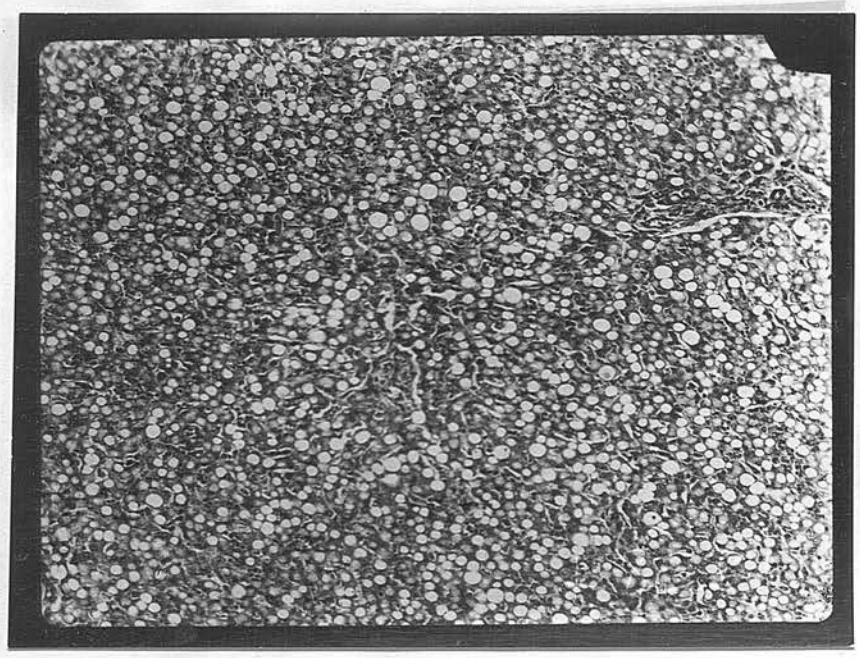
Kidney. Cellular degenerative changes and slight congestion.

Stomach. Post Mortem degenerative changes.
Marked round celled infiltration of mucosa.

Small gut. Considerable round celled infiltration of mucosa with some collections of lymphoid cells in the deeper parts of the mucous membrane. Slight round celled infiltration of walls and extra peritoneal tissue.

Large gut. No significant abnormality found.

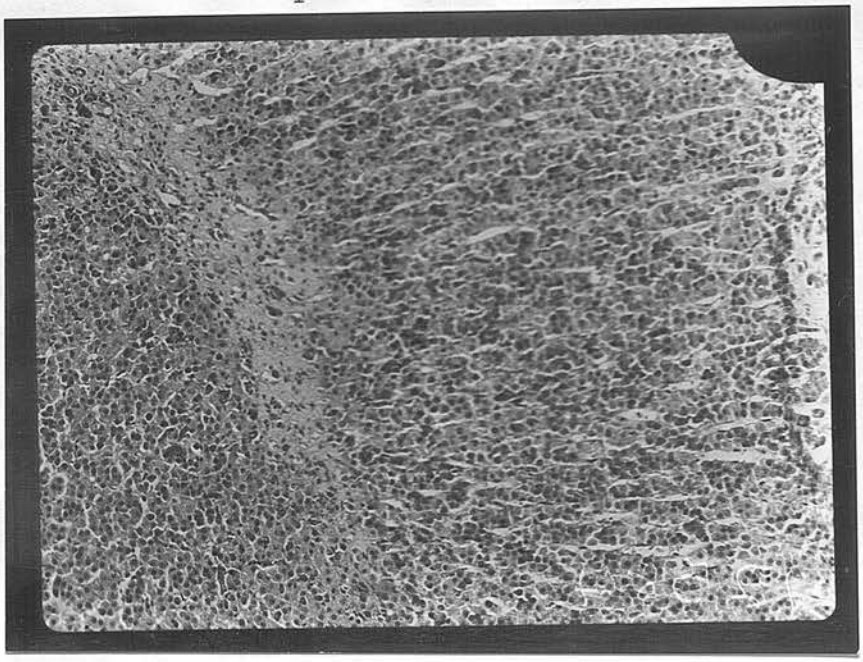
Suprarenal. No pathological changes seen.

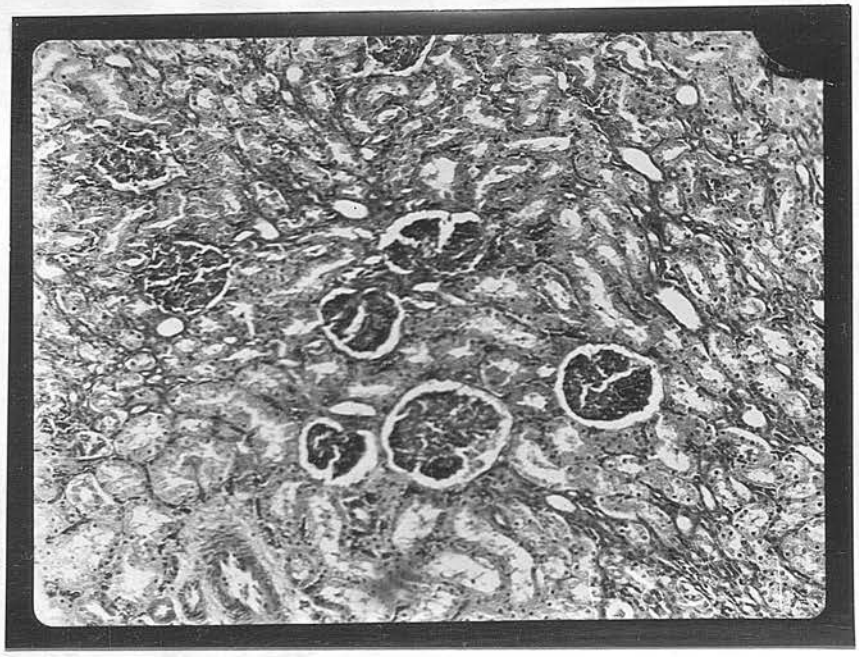


Liver.

CASE No. 1. (x 150 approx.)

Suprarenal.

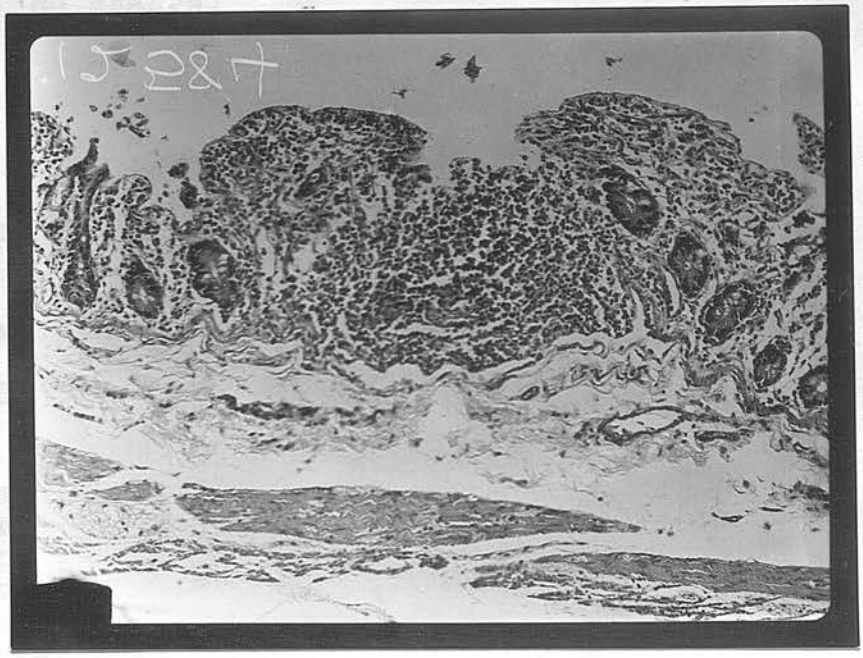




Kidney.

CASE No. 1. (x 150 approx.)

Gut.



CASE No. 2.

EMELE. (2661). Female. Age: 2 yrs. Tribe: Ngoni.

History.

Past History:-

12.12.47. Mild gastro-enteritis.

5. 1.48. Recurrence of gastro-enteritis. Attendance at Clinic irregular. Diarrhoea stated to have persisted on and off since early December, 1947.

9. 1.48. Gastro-enteritis controlled.

Family History:- Nil of note discovered.

Diet:- Consisted of breast-milk and mealie meal porridge.

Present Condition. 21. 1.48.

Routine examination shewed oedema of the feet and enlargement of the liver. No other abnormality detected.

Treatment and Progress.

The child was given a pint of milk daily at the Clinic and to this was added a heaped teaspoonful of "Food Yeast".

23. 1.48. No change.

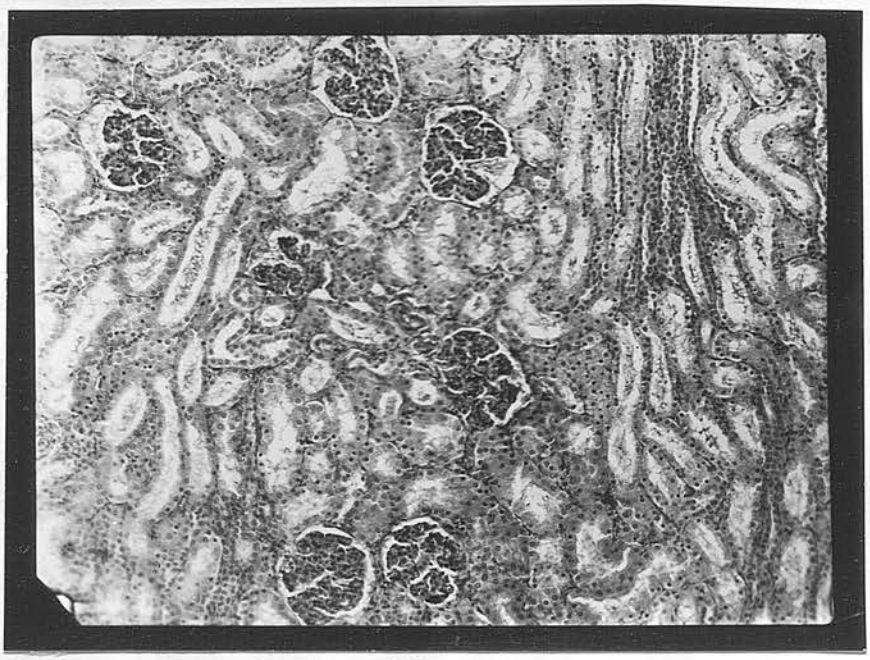
1. 2.48. Recurrence of gastro-enteritis associated with a mild bronchitis. Both responded to simple treatment.

14. 2.48. Developed conjunctivitis. Oedema of feet and enlargement of the liver still present. General condition poor.

Given a meat and vegetable meal daily at Clinic and started to receive four I.M.I. of Hepalon, 2 cc., every third day.

1. 3.48. Return of diarrhoea. Thick blood film examinations shewed no malarial parasites. Deterioration became rapid. Oedema became more marked and extended up almost to the knees. There was obvious depigmentation of the skin of the perineum and the upper parts of the thighs. The hair was pale, thin and straighter than normal. The child was very irritable and anorexia made feeding difficult.

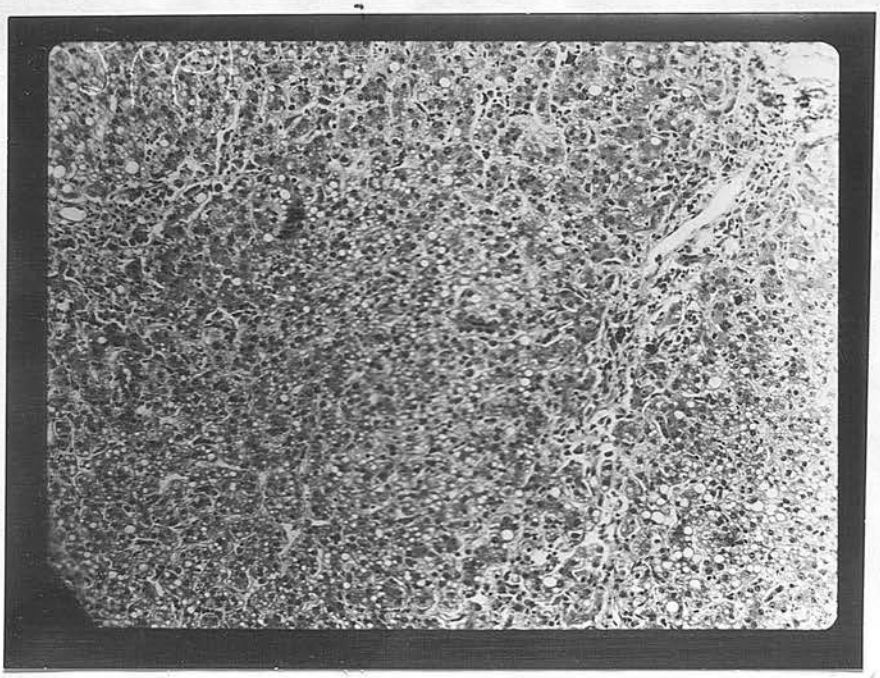
4. 3.48. Death.



Kidney.

CASE No. 2. (x 150 approx.)

Liver.



Post Mortem - 3 hours after death.

Skin changes and oedema as described.

Significant findings were:- a large fatty liver, bronchitis, an absence of fat in the mesentery and thin translucent small intestine walls.

Micros:-

Liver. Moderately severe fatty changes most marked at the periphery of liver lobules. Some round celled infiltration of the portal tracts. No increase of fibrous tissue detected.

Kidney. Congestion and cellular degenerative changes. Many glomeruli contained acidophil debris between capillary tuft and glomerular capsule.

CASE No. 3.

NANGE. (8795). Female. Age: 3½ yrs. Tribe: Bemba.

History.

Past History:-

3. 1.48. Attended Clinic with gastro-enteritis stated to have been present only one day. There was no oedema, or hair or skin changes. The gastro-enteritis responded to treatment fairly rapidly.

9. 1.48. Developed otitis media.

13. 1.48. Not attending regularly at Clinic. Ears better, but child looking undernourished. The mother was instructed to bring the child regularly for extra food plus a vitamin preparation containing Vitamins A, B_1, C and D.

Family History:-

Only child. Mother and father healthy.

Diet:-

Consisted of breast milk (in spite of her age) plus mealie meal porridge and thin soup made from bones and vegetables. No meat was included.

Present Condition. 2. 2.48.

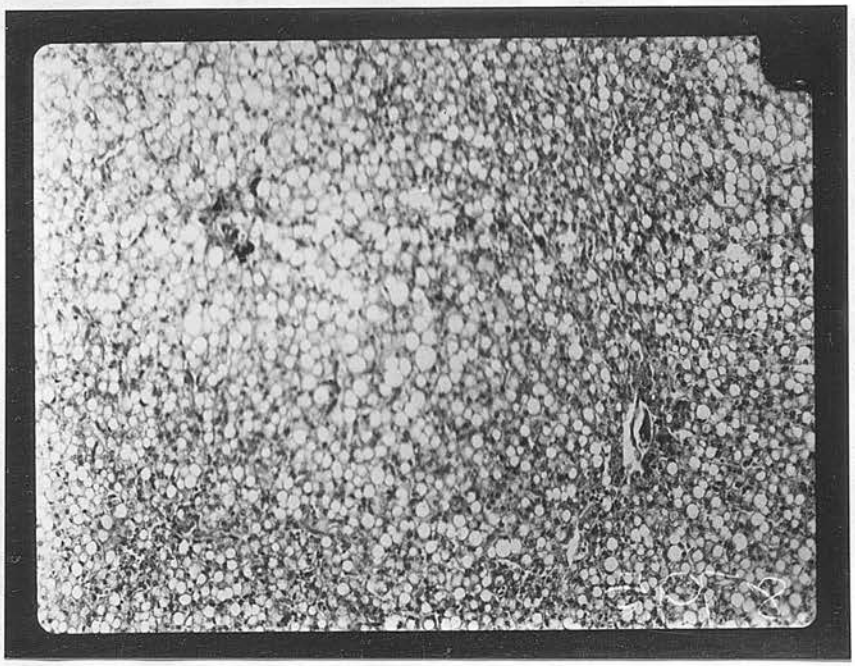
General condition much worse than when last seen. Attendance at Clinic very irregular. Found to have oedema of the feet and a few moist sounds at both lung bases. Urine and blood examinations revealed no abnormality.

Treatment and Progress.

The importance of regular attendance at the Clinic for extra nourishment was stressed. This consisted of about one pint of milk a day plus as much as the child could eat of a stew containing minced meat and vegetables cooked together.

19. 2.48. Not improving. Hair pale and atrophic. No skin changes. Oedema of feet still present.

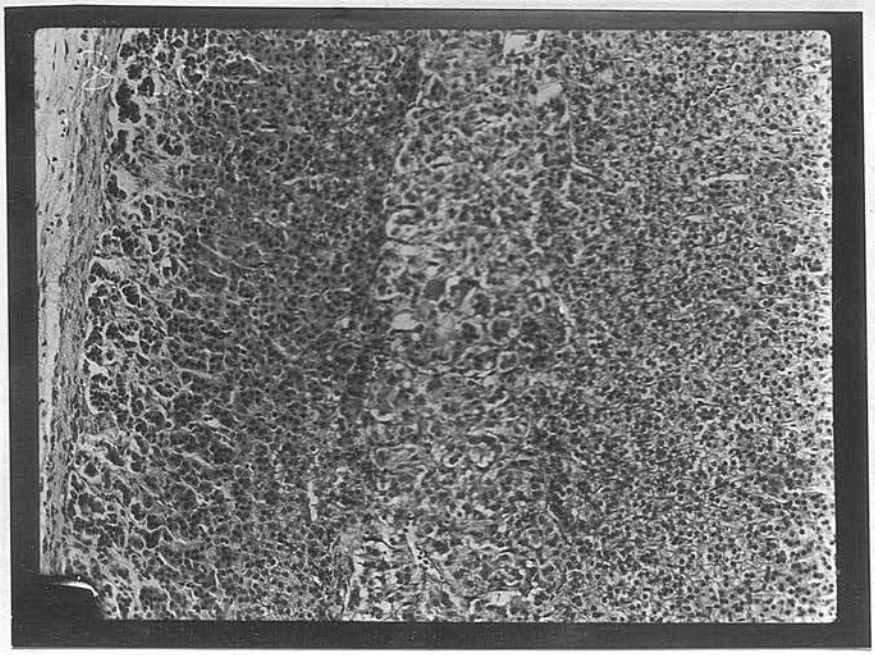
23. 2.48. Oedema more marked. Heart, N.A.D. A few moist sounds present at both lung bases. Liver enlarged, spleen not palpable. Depigmentation and exfoliation of the skin of the perineum, buttocks, and backs of thighs. Apyrexial.

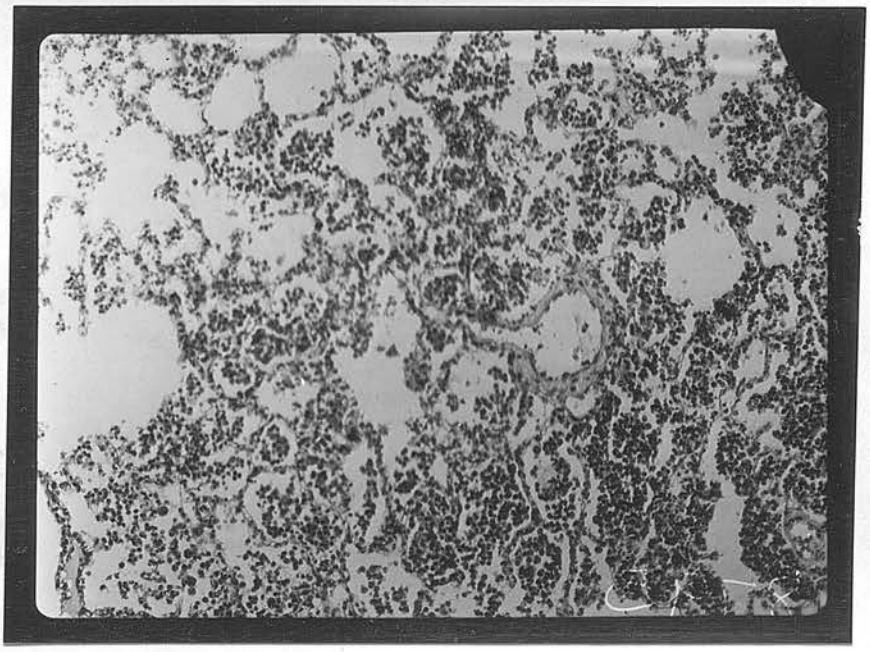


Liver.

CASE No. 3. (x 150 approx.)

Suprarenal.

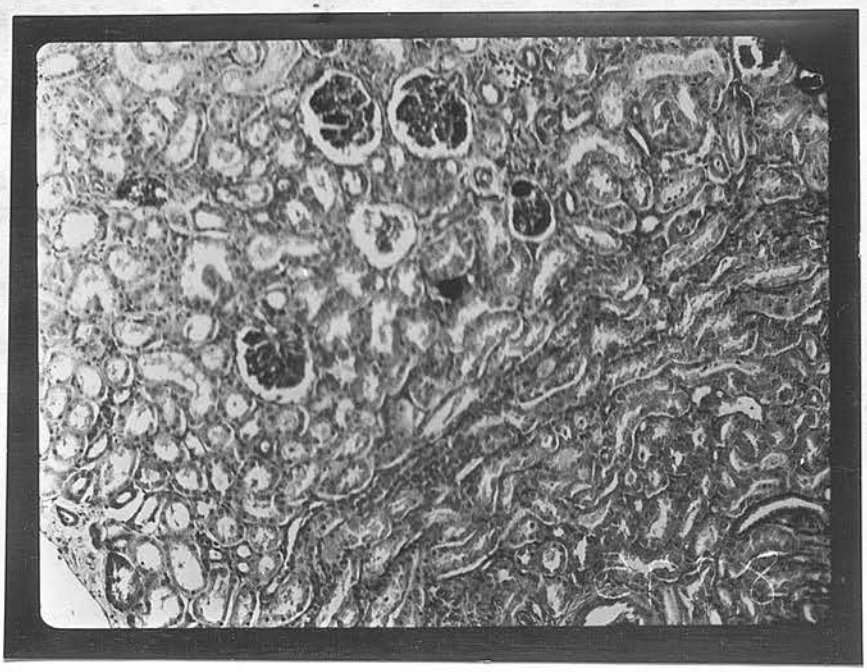




Lungs.

CASE No. 3. (x 150 approx.)

Kidney.



Blood examination:

R.B.Cs. 3,260,000 per cmm.
Hoemoglobin: 56·7% (or 8·73 Gm.%)
C.I. 0·88
No parasites found.

Given Casein hydrolysate and food yeast orally plus vitamins B and C.

Lethargy and anorexia made feeding very difficult. The child was very irritable on examination.

25. 2.48. Death.

Post Mortem - 2 hours after death.

Skin changes as above. There was no emaciation, in fact the child looked well nourished.

Significant findings were:-

Patchy bronchitis and congestion of the lungs, and an enlarged and fatty liver.

The bowel walls appeared normal and there was no obvious loss of mesenteric fat.

Micros:-

Liver. Gross fatty changes involving every liver cell in the section. Slight round celled infiltration of portal tracts which also contained scanty macrophages full of ingested pigment granules.

Lungs. Congestion. Patchy bronchiolitis and broncho-pneumonia.

Gut. Patchy round celled infiltration of mucosa with well marked collections of lymphoid cells.

Suprarenal. No obvious pathology.

Kidney. Degenerative cellular changes.

CASE No. 4.

CHILESHE. (9650). Male. Age: 1½ yrs. Tribe: Bemba.

History.

Past History:-

31. 1.48. Attended Clinic with diarrhoea which was stated to have been of one day's duration. The child was apyrexial and clinical examination revealed no abnormality except for an enlarged liver. Thick blood films shewed no malarial parasites. The mother stated that the child was always healthy.

Family History:-

Nil of note.

Diet:-

Breast milk and thin mealie meal porridge.

Present Condition. 14. 2.48.

Diarrhoea subsided but general condition deteriorated. There was slight oedema of the feet but no skin changes. The liver was enlarged. Chest and heart, N.A.D.

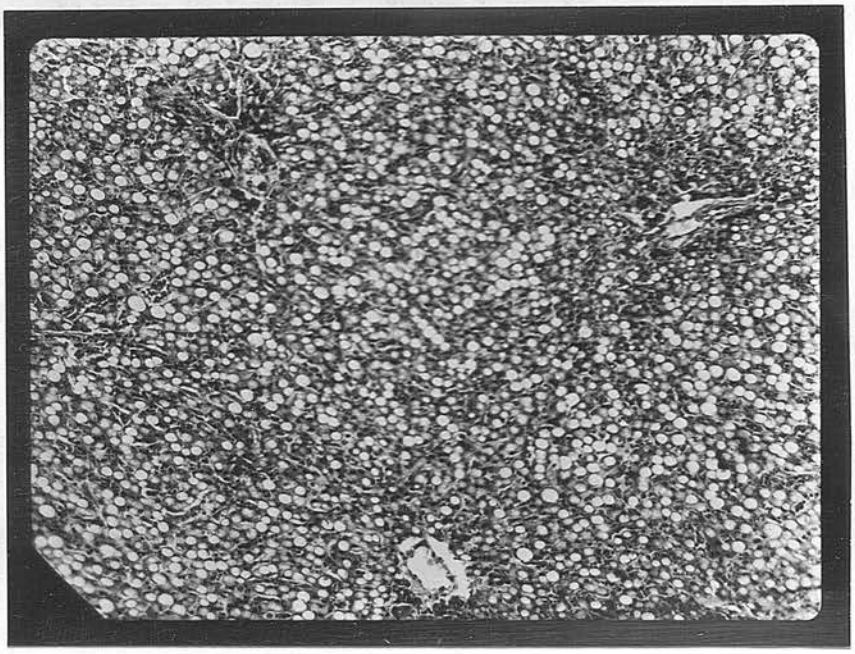
Treatment and Progress.

The mother was instructed to bring the child daily to the Clinic for extra nourishment (milk and meat) plus Hake Oil, minims 10; Vit. B_1 3 mgms.; and Ascorbic Acid 50 mgms.

23. 2.48. Much worse. Admitted to hospital. Oedema of both feet, depigmentation and exfoliation of skin of perineum, groins, upper and outer parts of thighs down to just below the knees. Liver enlarged, spleen not palpable. Heart, N.A.D. Chest: Moist crepitations at both bases. Hair pale, thin and atrophic, straighter than normal and scanty. The child was lethargic but irritable under examination.

Blood Slide shewed no parasites. R.B.Cs. 5,060,000. Hoemoglobin 87·1% (or 13·5 Gms. %). C.I. 0·86.

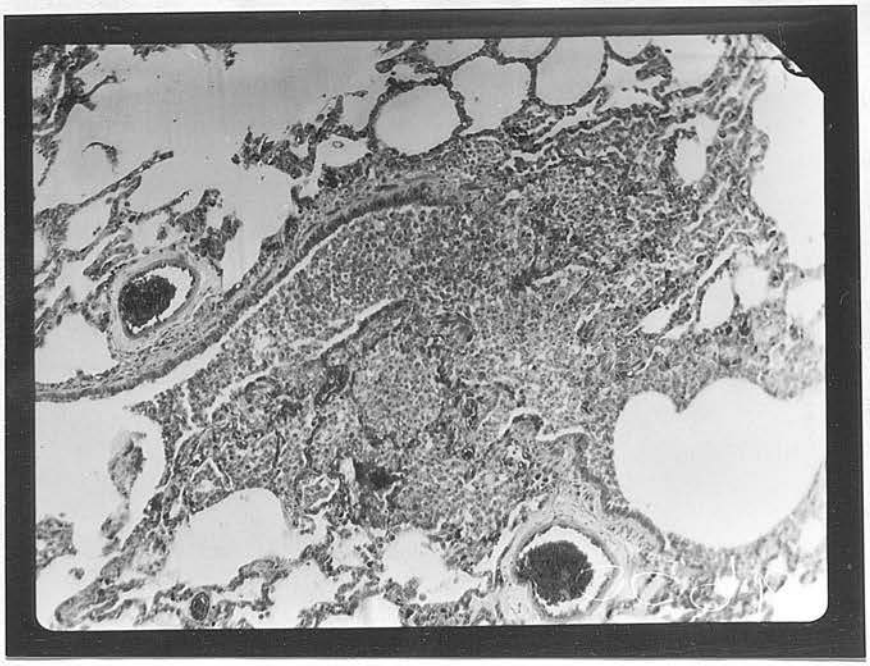
An attempt was made to give the child a minimum of one pint of milk plus 5 Gms. each of Casein hydrolysate and food yeast and 100 mgms. of nicotinic acid daily, but persistent anorexia made this difficult. Feeding by means of a tube passed through the nose into the stomach was tried, but as the mother invariably removed the tube whenever the Ward Sister wasn't looking this had to be discontinued.



Liver.

CASE No. 4. (x 150 approx.)

Lungs.



The child's condition deteriorated rapidly. Angular stomatitis developed and he became comatose. He died on 4. 3.48.

Post Mortem - 7 hours after death.

Significant findings were:-

Bronchitis and congestion of the lungs. An enlarged and fatty liver, pale thin and translucent gut walls and loss of mesenteric fat.

Micros:-

Liver. Gross fatty changes and slight round celled infiltration or portal tracts.

Lungs. Patchy bronchiolitis and bronchopneumonia.

Heart. Degenerative changes is muscle fibres.

Kidney. No significant abnormalities found.

Small gut. Considerable round celled infiltration of mucous membrane and sub-mucous layer. Slight round celled infiltration of muscle walls and extra-peritoneal tissue.

CASE No. 5.

AZELE. (12196). Male. Age: 15 mths. Tribe: Kaonde.

History.

Past History:-

Stated to have been perfectly well until 27.1.48 when he developed a cough and diarrhoea. The child was not brought to the Clinic until 30.1.48. Apart from scanty moist sounds at both lung bases, clinical examination shewed no abnormality. The blood slide was negative for malarial parasites.

Family History:- Nil of note.

Diet:- Breast milk only.

Present Condition. 16. 2.48.

Found on routine examination to have oedema of both feet and an enlarged liver. No abnormality found in chest or heart. The spleen was not palpable. No parasites were found on blood examination. The hair and skin appeared to be normal.

Treatment and Progress.

The mother was instructed to bring the child to the Clinic daily for extra nourishment. (Milk and soup, which contained some minced meat.)

23. 2.48. No improvement in oedema. Becoming rather lethargic.

26. 2.48. Obviously worse.

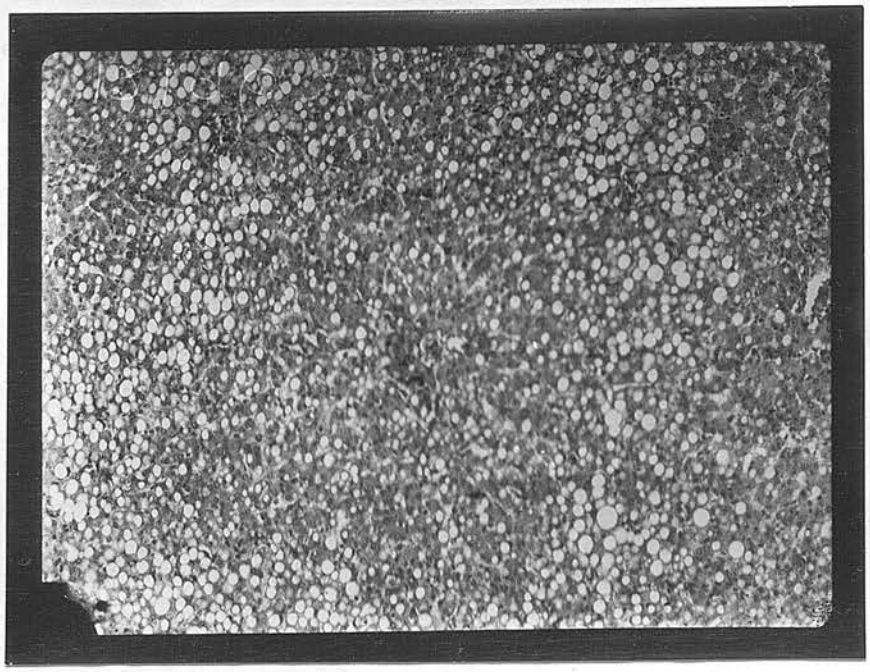
2. 3.48. Died.

Post Mortem - 12 hours after death.

Depigmentation of skin of perineum. Exfoliation of skin of upper part of thighs. No stomatitis or glossitis. Oedema of feet. Emaciation. Dissection revealed an enlarged fatty liver, thin atrophic-looking gut walls and an absence of mesenteric fat. The lungs shewed slight congestion and bronchitis.

Micros:-

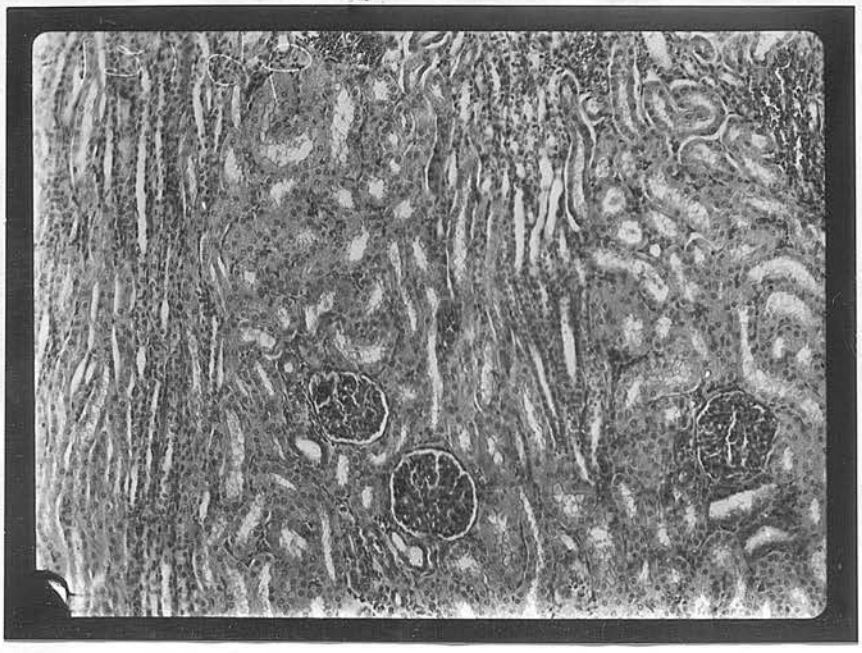
Liver. Gross fatty changes involving practically every cell in the liver lobules.



Liver.

CASE No. 5. (x 150 approx.)

Kidney.



Lungs. Mild congestion and bronchiolitis.

Heart. Degenerative changes in muscle cells.

Kidney. Slight congestion. Cellular degenerative changes.

CASE No. 6.

JOSEPH. (11015). Male. Age: 1½ yrs. Tribe: Kaonde.

History.

Past History:-

No reliable past history obtainable before 15.1.48. The child was then brought to the Clinic with acute gastro-enteritis. The routine blood slides shewed no malarial parasites and the condition responded to simple measures.

4.2.48. Recurrence of diarrhoea which responded rapidly to treatment. The child was given extra nourishment consisting of milk (up to a pint a day) and a meat soup from this date on whenever the mother brought it to the Clinic.

10. 2.48. Some slight improvement noted with gain in weight.

17. 2.48. Pyrexia, found to be due to subtertian malaria. The malarial infection responded normally to quinine, but the patient became progressively more emaciated in spite of regular attendance for extra food. The mother denied that the child had diarrhoea.

26. 2.48. Preparations of Vitamin B and C added to diet.

Present Condition. 4. 3.48.

Routine examination shewed an emaciated child with thin hair which was paler than normal and practically straight. No skin changes were present. Slight oedema of both feet. The heart was normal; a few moist sounds were heard at both lung bases. The liver was palpable. There was no glossitis or angular stomatitis.

Treatment and Progress.

Hospitalisation being refused, the treatment already being given at the Clinic was continued and one teaspoonful of food yeast was given in milk twice daily.

11. 3.48. The child was obviously worse and the oedema more marked.

16. 3.48. Death.

Permission for post mortem examination was refused.

CASE No. 7.

ENOSI. (2599). Male. Age: 1½ yrs. Tribe: Ngoni.

History.

Past History:-

Stated to have been well until one week before being seen at the Clinic. The child then developed diarrhoea and cough which continued to date.

Family History:-

Both parents healthy. One other child (older) healthy.

Diet:-

Breast fed entirely.

Present Condition. 27. 3.48.

A thin undernourished child with oedema of the feet and ankles and puffy lower eyelids. There was depigmentation of the skin of the genital area and the tops of the thighs. Exfoliation was present in patches in these areas too. Hyperpigmented areas of skin (of the "Crazy-pavement" variety) were found on the shins and the outer aspects of both arms. Angular stomatitis was present but no glossitis or cheilosis. The child was irritable under examination and cold.

There were frequent loose green stools which contained some mucus. The heart sounds were normal, the lungs were moist in all areas, the liver was palpable two fingers' breadth below the right costal margin and the spleen was not palpable.

Thick blood film examination revealed the presence of scanty subtertian malarial parasites.

Treatment and Progress.

An intramuscular injection of quinine gr.v was given to control the malarial infection and thereafter quinine gr.v, b.d. orally.

Glucose fluids only were allowed in the first 12 hours, but as the diarrhoea appeared to have ceased then, the patient was given one pint of milk daily and to this was added 5 Gms. each of Casein hydrolysate and food yeast.

One intramuscular injection of a Vitamin B complex containing 3 mgms. of Thiamin, 2 mgms. of riboflavin, 25 mgms. of nicotinic acid and 2 mgms. of pantothenic acid, was also given.

Pronounced lethargy and anorexia made feeding attempts difficult.

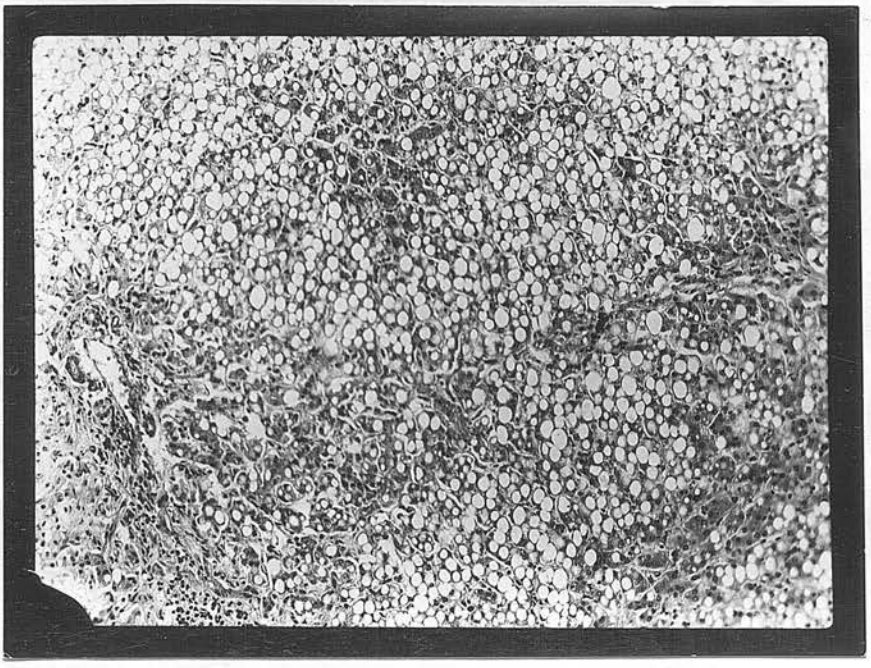
No progress was made and the child died on the third day of treatment.

Post Mortem - 14 hours after death.

This shewed a bronchitis, an enlarged and fatty liver, and an absence of mesenteric fat. There was congestion of the kidneys and spleen.

Micros:-

Liver. Gross fatty changes involving every liver cell in the section. Mild round celled infiltration of the portal tracts which also contained scattered macrophages full of ingested pigment granules.



Liver.

CASE No. 7. (x 150 approx.)

CASE No. 8.

AKANI. (4713). Male. Age: 1 yr. Tribe: Bulima.

History.

Past History:-

No history of previous illness could be obtained from the mother. She could not even state when the child first became ill and seemed to think it had been well until three days before she brought it to the Clinic.

Family History:-

Parents appeared healthy. Two other children were healthy. The mother was not pregnant.

Diet:-

Breast milk only.

Present Condition. 28. 3.48.

An emaciated, lethargic, and obviously very sick child. Temperature 100°F. There was oedema of both feet and ankles but no skin changes were found. The hair was pale, thin and very scanty. Heart sounds normal, moist crepitations were present in all lung areas. The liver was palpable one finger's breadth below the right costal margin in the mid-axillary line, but the spleen was not palpable. Thick blood film examination shewed no malarial parasites.

Treatment and Progress.

The child was admitted to hospital but died within twentyfour hours.

Post Mortem - 14 hours after death.

This shewed broncho-pneumonia, an absence of all mesenteric fat, thin translucent bowel walls, and an enlarged fatty liver.

Micros:-

Liver. Mild fatty changes were seen at the periphery of the liver lobules and a round celled infiltration of the portal tracts which also contained pigment filled macrophages.

CASE No. 9.

CHEMBE. Male. Age: 1½ yrs. Tribe: Nsenga.

History.

Past History:-

No history of any previous disease obtainable.

Family History:-

Nil of note.

Diet:-

Breast milk and a little mealie meal porridge.

Present Condition. 2. 4.48.

Referred for advice and treatment from Government Clinic at Luanshya, - because of loose frequent green stools and pyrexia of unknown duration. Found to have oedema of both feet and ankles, depigmentation of the skin of the perineum and upper part of thighs; scanty thin and pale hair and to be emaciated, cold and miserable. The liver was enlarged two fingers' breadth below the right costal margin and the spleen not palpable. Heart sounds were normal, moist crepitations were present at both lung bases. No abnormalities of the nervous system were detected and no malarial parasites were found in a thick film preparation.

Treatment and Progress.

On a diet consisting of as much milk as the child could be persuaded to drink in a day, (between 1½ and 2 pints) supplemented by Casein hydrolysate Gms 5 daily, and food yeast 4 Gms daily, plus an intra-muscular injection of Vitamin B complex on alternate days for four injections, the child's weight increased from 13 to 15½ lbs. in two weeks. The oedema disappeared completely and the skin lesions healed.

The child was discharged from hospital on 17. 4.48 and the mother instructed to attend with the child daily at the Government Clinic for extra nourishment and general supervision.

25. 5.48. Re-admitted in a far worse condition than when seen originally.

The hair was straight, scanty and pale. There was conjunctivitis, angular stomatitis, glossitis and bronchitis. Depigmentation of the skin of the genital area and upper parts of thighs was marked and exfoliation was present in patches on the buttocks and thighs.

There was oedema of the feet and ankles and hyperpigmentation of the skin of the shins. ("Crazy pavement" type). The liver was enlarged to two fingers' breadth below the right costal margin, the spleen not palpable and the heart sounds normal. Malaria was not present. The child was apyrexial, very lethargic and had pronounced anorexia.

No improvement took place on treatment with milk to which was added Casein hydrolysate 5 Gms. per pint and dessicated hog's stomach 4 Gms. per pint, plus intra-muscular injections of Vitamin B complex 2 cc. daily. The anorexia made feeding practically impossible. The child died on 27. 5.48.

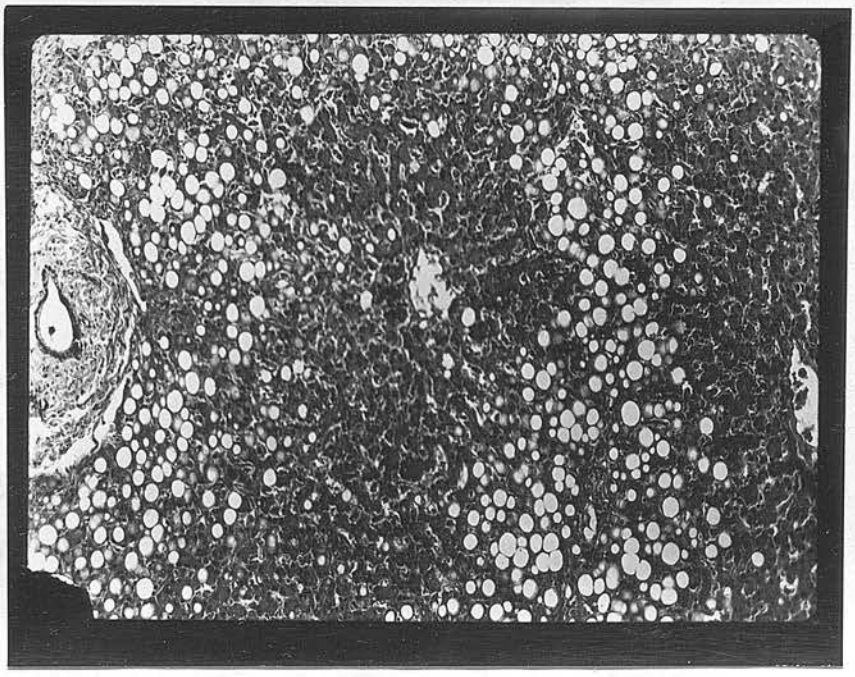
Post Mortem - 2 hours after death.

An enlarged fatty liver, congestion of the kidneys, thin translucent bowel walls with a complete absence of mesenteric fat and a bronchitis.

Micros:-

Liver. Moderately severe fatty changes involving about 50% of the liver lobule cells. Slight round celled infiltration of the portal tracts. No increase of fibrous tissue was detected.

Kidney. Congestion and cellular degenerative changes.



Liver.

CASE No. 9. (x 150 approx.)

CASE No. 10.

CHIBUYE. (9010) Male. Age: 1½ yrs. Tribe: Bisa.

History.

The child had spent three months at his mother's village (Chief Muchinka, Serenje District) and according to his mother, its present condition started while she was on her way back to Luanshya, a journey of about fourteen days. No reliable history of previous illness could be obtained, but the child was stated to have suffered occasionally from diarrhoea.

Family History:-

Both parents healthy and two older children appeared to be perfectly normal.

Diet:-

Breast milk (breasts thin and contained only a small quantity of watery looking 'milk'), and mealie meal porridge. No meat, milk or vegetables.

Present Condition. 7. 8.48.

An emaciated, practically comatose child, with pale very scanty straight hair, oedema of feet, ankles and perineum, patchy exfoliation of the skin of the buttocks and tops of thighs, depigmentation of skin of perineum, buttocks, thighs and legs, and hyper-pigmented areas - of the "crazy pavement" type - of the skin of the outer borders of the legs and arms. The lungs were moist in all areas, the heart sounds normal, the spleen not palpable, and the liver palpable one finger's breadth below the right costal margin. Angular stomatitis was present but no glossitis or cheilosis.

Treatment and Progress.

The child died a few hours after admission to hospital.

Post Mortem - 12 hours after death.

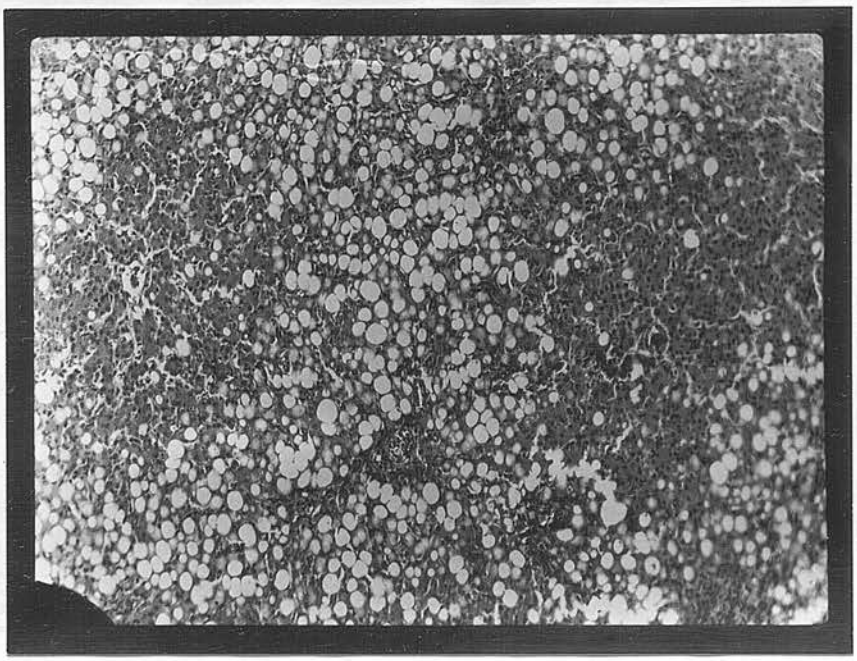
Bronchitis, an absence of mesenteric fat, an enlarged fatty liver and thin translucent bowel walls. Other organs appeared normal except for some congestion.

Micros:-

Liver. Marked fatty changes present in the cells at the periphery of liver lobules. The portal tracts were well defined, but there did not appear to be any increase of fibrous tissue.

Kidney. Congestion and cellular degenerative changes.

Pancreas. No abnormality found.



Liver.

CASE No. 10. (x 150 approx.)

CASE No. 11.

MATENDEKO. (11429). Male. Age: 8 mths. Tribe: Ushi.

History.

No past history obtainable except for the rather vague statement that the child had had attacks of diarrhoea recently.

Family History:-

Parents healthy. One older child healthy.

Diet:-

Breast milk plus a very little thin mealie meal porridge once a day.

Present Condition. 9. 8.48.

An obviously sick, irritable child weighing 13 lbs. There was oedema of the feet and ankles, depigmentation of the skin of the perineum, the lower parts of the buttocks and the insides of the thighs; small patches of hyperpigmentation of the skin of the face and outer parts of the legs, and fairly normal hair. The heart sounds were normal and moist crepitations were heard at both lung bases. The spleen was not palpable, the liver was palpable and firm.

Treatment and Progress.

The mother continued breast feeding but this was supplemented with half a pint of ordinary milk a day, plus 2 Gms. of Casein hydrolysate.

Pronounced anorexia developed and the child became comatose and died on 13. 8.48.

Post Mortem - 12 hours after death.

A reduction in mesenteric and omental fat, mild gastro-enteritis, an enlarged liver, bronchitis and congestion of kidneys and spleen.

Micros:-

Liver. Congestion most marked at the periphery of liver lobules, cellular degenerative changes and very slight fatty changes.

Spleen. Congestion.

Kidney. Congestion.

Suprarenals. No obvious pathology.

CASE No. 12.

BELINDA. (1110). Female. Age: 1½ yrs. Tribe: Bemba.

History.

14. 9.48. The child was brought to the hospital dead.

The mother appeared quite healthy and said that the child had had diarrhoea and a cough for about a week. She had been breast fed and had also received thin mealie meal porridge.

Post Mortem - 18 hours after death.

Typical skin and hair changes of malignant malnutrition, and oedema of the feet and ankles. Section revealed an extensive broncho-pneumonia, a normal heart, congestion of kidneys, liver and spleen. Enlargement of liver and spleen, an absence of mesenteric and omental fat and thin translucent gut walls.

Micros:-

Liver. Moderate fatty changes most marked at the periphery of lobules. Round celled infiltration of portal tracs which also contained many large macrophages full of pigment granules.

Lungs. Extensive broncho-pneumonia.

Kidney. Congestion and degenerative cell changes.

Spleen. Congestion. Many macrophages present containing pigment granules. Malarial parasites not identified.

CASE No. 13.

SOPHIA. (5046). Female. Age: 2½ yrs. Tribe: Bisa.

History.

The child was first seen on 28. 9.48. No history of previous illness could be obtained from the mother. Both parents were healthy, as was one younger child.

Diet:-

Mealie meal porridge and soup made from bones and vegetables.

Present Condition.

An obviously sick child with oedema of the face, arms and feet and respiratory distress. Examination shewed consolidation of the left upper lobe; an enlarged heart with a loud systolic murmur heard all over the chest but which was loudest at the base; slight ascites and an enlarged liver. Temperature was 101° F, pulse rate 140 per min, and respirations 45 per min.

No skin changes were seen; the hair was pale and thin.

Treatment and Progress.

Sulphapyridine Gm. ¼, four hourly for five days and a simple expectorant resulted in fairly rapid improvement of the pneumonia. At the same time the exhibition of Tinct. Digitalis in suitable doses brought the pulse rate down to 80 per min. in seven days. During this time oedema disappeared from the face and arms but could still be detected at the ankles. Moist crepitations could still be heard at both bases however. The child was given one pint of milk daily at first, but as her condition improved meat and vegetables were added.

Improvement in her general condition was slow but steady until 4.10.48, when she began to deteriorate suddenly and rapidly for no apparent reason. Appetite diminished, the pulse rate rose slowly and the child became increasingly lethargic. Oedema did not increase but could always be detected at the ankles. She died on 20.10.48.

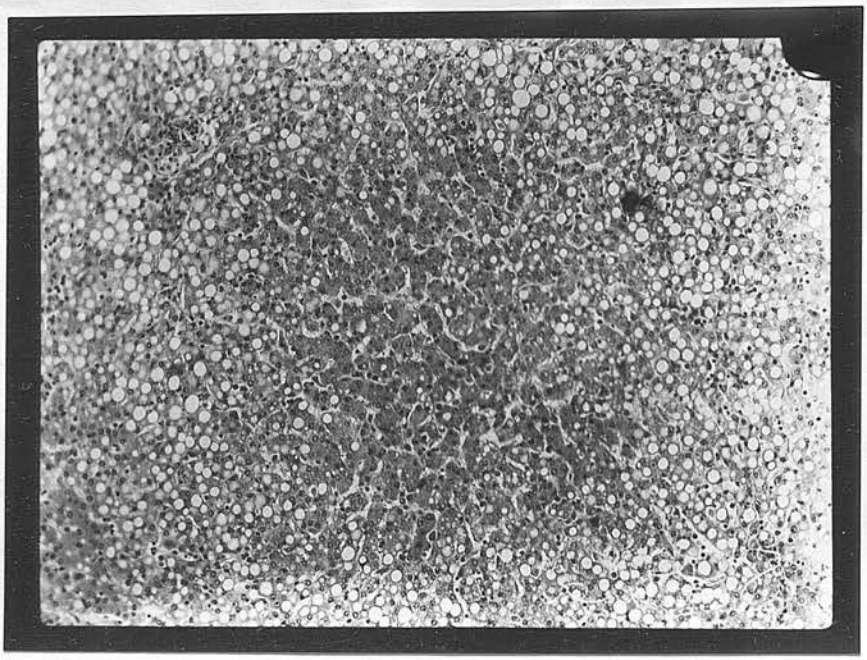
Post Mortem - 12 hours after death.

Revealed terminal congestion of both lungs; stenosis of the aortic valve with dilatation of the first part of the aorta (a patent ductus arteriosis could not be demonstrated); enlargement of the liver; and congestion of the kidneys. The bowel wall was thin and no fat was present in the mesentery. Subcutaneous fat appeared to be normal in amount.

Micros:-

Liver. Considerable fatty changes involving more than 50% of the cells in the liver lobules. There was some round celled infiltration of the portal tracts and slight venous congestion. No increase of fibrous tissue could be demonstrated.

Kidney. Congestion and cellular degenerative changes only.



Liver.

CASE No. 13. (x 150 approx.)

CASE No. 14.

PHILLIS. (12214). Female. Age: 1½ yrs. Tribe: Ngoni.

History.

This child was seen on 1.11.48. It was then moribund. The mother stated that it had had severe diarrhoea for two days only and that apart from that it had been well.

Diet:-

Breast milk and thin mealie meal porridge.

Present Condition.

On examination the child was seen to be severely dehydrated and emaciated. There were small areas of hyperpigmented skin on both legs, oedema of the dorsum of the feet and the ankles, very scanty, pale atrophic hair and a few small ulcerated lesions on the face and body. The chest was moist at both bases and the heart appeared to be normal. The liver was palpable two fingers' breadth below the right costal margin. The spleen was not palpable. The child died two hours later.

Post Mortem - 15 hours after death.

Shewed a fairly extensive broncho-pneumonia, an enlarged fatty liver, thin-walled small intestines and an absence of mesenteric fat and an enteritis.

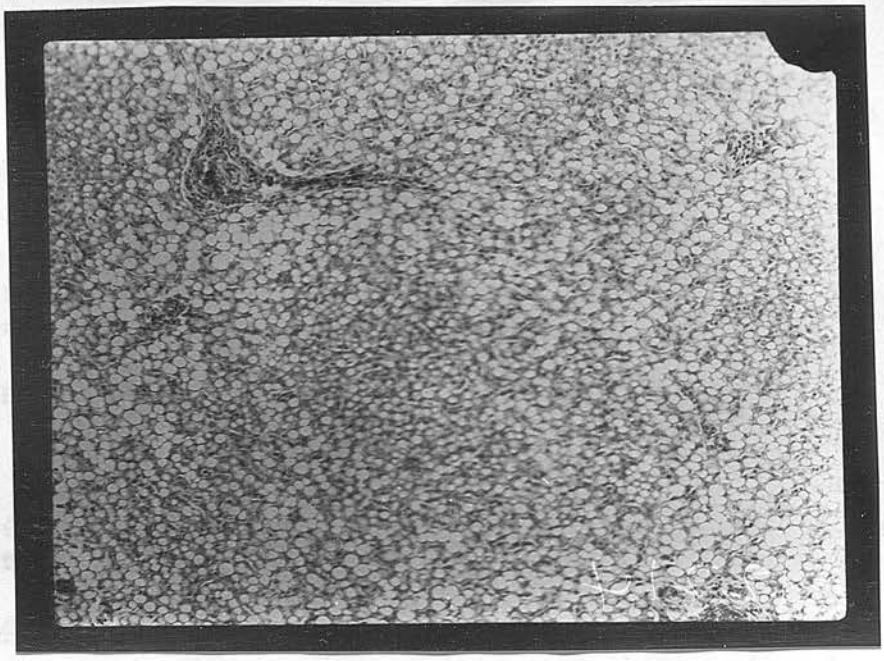
Micros:-

Liver. Gross fatty changes involving every cell in the liver lobules.

Kidney. Slight congestion and marked cellular degenerative changes.

Pancreas. No obvious pathology.

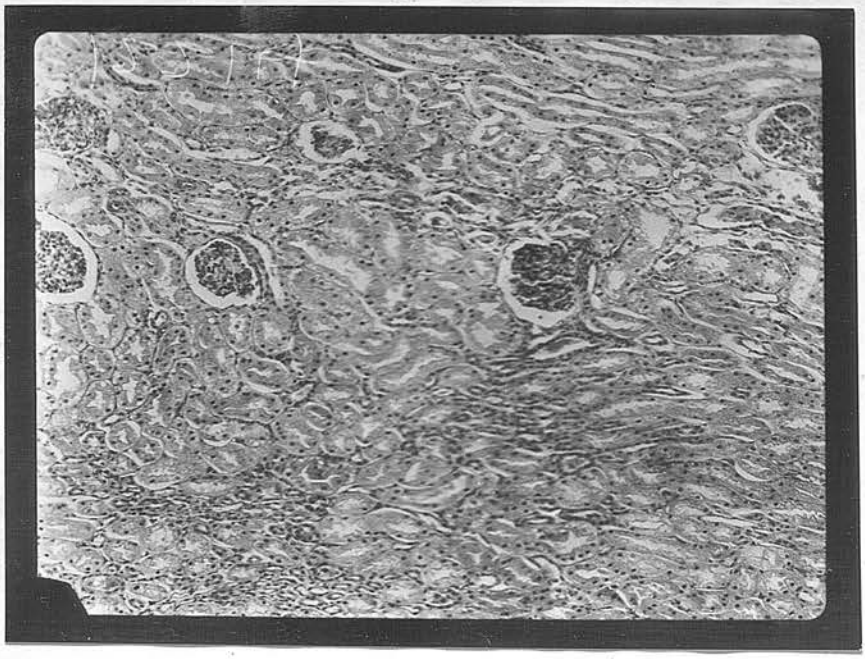
Suprarenal. No obvious pathology.



Liver.

CASE No. 14. (x 150 approx.)

Kidney.



CASE No. 15.

MWANZA. (10052) Female. Age: 2 yrs. Tribe: Nsenga.

History.

The child was first seen on 20.11.48 and appeared to be practically moribund.

The only history that could be obtained was that the child had had diarrhoea and vomiting for some days before being brought to the Clinic. Both parents appeared well as did one other older child. The mother was pregnant.

Diet:-

Consisted of mealie meal porridge, soup and vegetables plus a small amount of meat occasionally.

Present Condition.

A severely dehydrated and emaciated child with oedema of the feet and ankles; depigmentation of the skin of the perineum, the fronts of the thighs and the lower abdomen; very scanty thin pale hair and an angular stomatitis. The chest was moist in all areas; no abnormality of the heart was found; the liver was enlarged one and a half fingers' breadth below the right costal margin and the spleen was not palpable. No malarial parasites were found on routine blood examination. There were frequent loose green and foul-smelling stools.

Treatment and Progress.

Glucose fluids were given orally and a little milk. Anorexia and lethargy were marked but the mother refused to give permission for the administration of fluids either intravenously or by gastric drip. In spite of this we managed to overcome the dehydration and the diarrhoea subsided a little. Exfoliation of the skin of the thighs and legs started on 21.11.48 and the child's condition became rapidly worse. She died next day.

Post Mortem - 1 hour after death.

Shewed bronchitis, a large fatty liver, thin atrophic looking gut walls, an absence of mesenteric fat and a diminution of subcutaneous fat.

Micros:-

Liver. Extensive fatty infiltration most marked at the periphery of liver lobules but involving more than 50% of liver cells.

Kidney. Degenerative cell changes especially in the cortex and slight congestion of the glomerular capillaries.

Pancreas & Suprarenal. Nil of note.

Liver.

Pancreas.

Kidney.

CASE

No.

15.

(x 150 approx.)

CASE No. 16.

NDELEMANJA. (10078) Male. Age: 2 yrs. Tribe: Kunda.

History.

The child was first seen on 30.11.48. It was then stated to have been ill with a cough and fever for a few days. No history of previous illness could be obtained.

Both parents appeared healthy. There were no other children.

Diet:-

Breast milk, mealie meal porridge and meat occasionally.

Present Condition.

Found to have bronchitis, diarrhoea and malaria (subtertian). (These responded rapidly to energetic treatment.) There was no oedema and no skin changes. The hair was scanty, pale and straighter than normal. The liver was palpable one finger's breadth below the right costal margin.

Treatment and Progress.

The mother was instructed to attend the Clinic daily so that the child could receive extra nourishment in the form of milk and minced meat stew.

6.12.48. General condition worse. The child was apyrexial and there had been no diarrhoea for six days, but moist sounds could be heard at both lung bases. There was slight angular stomatitis and glossitis, small depigmented skin areas on the inner aspects of both thighs and the perineum, very slight "crazy pavement" skin on the outer aspects of both legs and oedema of the feet. No further enlargement of the liver could be detected. The spleen was not palpable and no malarial parasites were found on blood examination. Anorexia was pronounced. Hospitalisation was refused. The child died on 10.12.48.

Post Mortem examination was refused.

CASE No. 17.

GEORGE. (1446) Male. Age: 1½ yrs. Tribe: Lamba.

History.

Past History:- - as obtained from Clinic Records.

9. 8.47. Septic Scabies.

20. 1.48. Bronchitis.

28. 5.48. General debility. Septic sores on buttocks. Did not attend for more than three days.

10. 6.48. Undernourished and debilitated. Mother told to bring child daily for extra nourishment. Only attended three times.

18.10.48. Gastro-enteritis. Dehydrated. No malaria. Only attended three times.

11.11.48. Diarrhoea for one week. Found to have subtertian malaria.

15.11.48. No diarrhoea. Emaciated and irritable. No skin changes. Liver enlarged. Heart and chest N.A.D.

23.11.48. Attending fairly regularly for extra nourishment, but still emaciated and miserable.

27.11.48. Improving.

No further attendance at Clinic and child not seen again until he was brought to the hospital dead on 15.12.48.

When last seen - 27.11.48 - there were no skin changes and no oedema, but the liver was enlarged.

On 15.12.48 at Post Mortem examination, there was oedema of the feet, depigmentation and exfoliation of the skin of the perineum, the thighs, buttocks and legs, hyperpigmentation of the skin of the outer parts of the legs and the back, and thin pale atrophic hair. Section shewed an enlarged fatty liver, an absence of mesenteric fat and a bronchitis.

CASE No. 18.

JELE VASHIYO (3668) Male. Age: 1½ yrs. Tribe: Ngoni.

History.

First seen on 26. 3.48. Found to be a breast fed child (then aged 9 months) who appeared to be perfectly healthy but for conjunctivitis and slight diarrhoea. Clinical examination shewed no other abnormality.

Diarrhoea and attendance at Clinic continued intermittently until 1. 4.48, when a marked improvement was noted.

12. 8.48. Acute gastro-enteritis. Hospitalisation refused. Malarial parasites not found on blood examination. Weight: 18 lbs.

19. 8.48. Improved. Weight: 18 lbs. 6 ozs.

16. 9.48. Bronchitis. Blood slide negative for malaria.

22. 9.48. Developed measles and when recovering was given milk daily at the Clinic.

5.10.48. Severe diarrhoea. Stool culture negative. Weight: 16 lbs. 10 ozs. Mother instructed to bring the child daily to the Clinic for extra nourishment and for general care and supervision.

11.10.48. Still having intermittent diarrhoea.

14.10.48. Improving. Weight: 17 lbs.

17.10.48. Well. Weight: 17 lbs. 12 ozs.

30.10.48. Recurrence of diarrhoea. Chest moist at both lung bases. Slight enlargement of liver to palpation. Blood slide negative for malarial parasites.

4.11.48. Diarrhoea stopped. Weight: 16 lbs. 6 ozs.

14.11.48. Recurrence of diarrhoea. Weight. 15 lbs. 6 ozs.

22.11.48. Again much improved and gaining weight. 16 lbs.

6.12.48. Recurrence of diarrhoea with occasional vomiting. Found to have further enlargement of the liver (to two fingers' breadth below right costal margin) oedema of the feet, thin scanty hair and slight "crazy pavement" skin on the outer aspects of both legs. Heart: N.A.D. Chest - a few moist crepitations at both bases. Hospitalisation refused. Instructed to attend Clinic regularly.

10.12.48. Diarrhoea stopped. Extra feeding pressed. (Milk and a mince and vegetable stew daily.

17.12.48. General condition much worse. Oedema more marked. Pallor of skin (but no obvious anaemia.) Commencing depigmentation of skin of perineum and thighs.

26.12.48. Died.

Post Mortem examination refused.

CASE No. 19.

MICHAEL (2293) Male. Age: 9 mths. Tribe: Bemba.

History.

Past History:-

10. 8.48. Normally developed infant (5 months) found to have subtertian malaria, which responded readily to treatment.

13.12.48. Another attack of subtertian malaria.

16.12.48. Diarrhoea and vomiting.

28.12.48. Recurrence of diarrhoea.

29.12.48. Obviously worse and admitted to hospital.

Present Condition.

A sick dehydrated but not undernourished infant with acute gastro-enteritis and pyrexia (100°F). Clinical examination shewed no abnormality except for dehydration and a few moist crepitations at both lung bases. No malarial parasites found on examinetion of a thick blood film. Stool culture failed to demonstrate any pathological coliform bacilli.

Treatment and Progress.

Diarrhoea and vomiting stopped after 24 hours on glucose water only, and the temperature became normal but the child's condition deteriorated in spite of this. He became very irritable, refused all food but breast milk and started to look rather thin.

5. 1.49. Recurrence of diarrhoea associated with a cough. Chest examination shewed moist crepitations in most areas. Improved rapidly on M & B 760, Grm. ¼, four hourly.

10. 1.49. General condition still not good. Given Tabs. Vitamin B Complex 1 t.i.d. and about half a pint of milk daily, in addition to normal breast feeds.

14. 1.49. Developing depigmented areas on the inner aspects of thighs and the perineum.

15. 1.49. Patchy depigmentation of the skin of the face. Oedema of the scrotum and ankles.

16. 1.49. Patchy exfoliation of the skin of the back, the buttocks, thighs and the outer aspects of legs. More oedematous. Urine contained a trace of albumen but no casts or red cells.

17. 1.49. Marked circum-oral pallor. No stomatitis or glossitis. Liver palpable two fingers' breadth below right costal margin.

21. 1.49. Skin changes halted and oedema beginning to decrease on diet of milk - one pint daily (plus breast feeds) fruit and tripe. This diet was started on 14. 1.49.

26. 1.49. Marked improvement. Skin lesions healing.

29. 1.49. Improvement maintained.

31. 1.49. No oedema. Skin lesions healed. Child appears to be recovering well but mother insisted on taking it from Hospital on 2. 2.49. She was instructed to attend the Clinic regularly daily for extra food for the child. This she did.

1. 4.49. Measles. Recovery uneventful. Child appeared normal except for rather scanty hair. Liver palpable one finger's breadth below right costal margin.

18. 5.49. Hair still rather thin, otherwise normal looking child.

16. 6.49. Died suddenly.

Post Mortem - about 12 hours after death.

Intense congestion of the lungs with broncho-pneumonia, congestion and enlargement of spleen and liver, congestion of the kidneys with minute abscesses, congestion of the pancreas also with small abscesses present and congestion of the brain.

Micros:-

Lungs. Gross congestion and broncho-pneumonia. In places there was destruction of lung tissue and abscess formation.

Liver. Congestion. Fatty changes at periphery of liver lobules and round celled infiltration of portal tracts. No abscesses found.

Spleen. Congestion. Large numbers of pigment filled cells present.

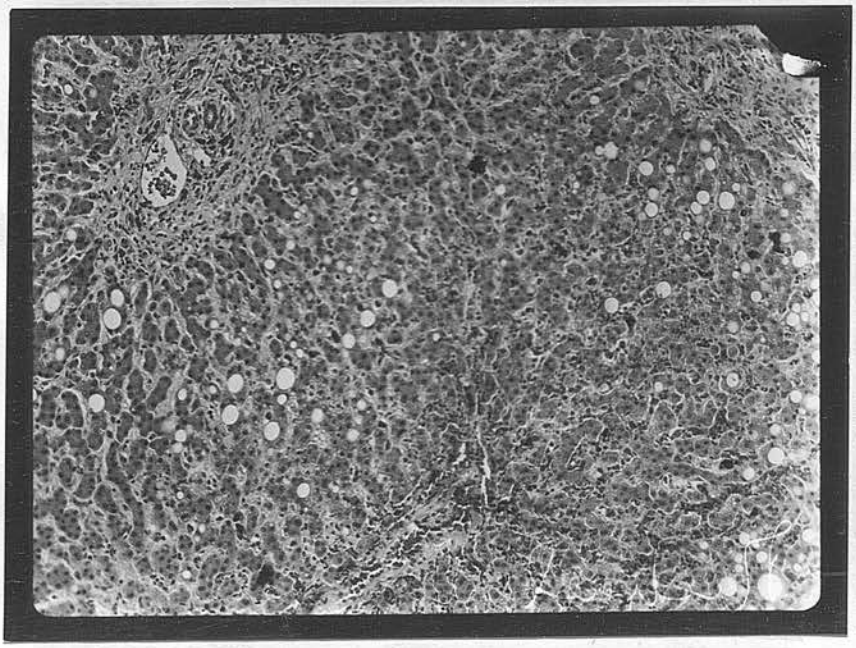
Suprarenal. Marked congestion.

Brain Cortex and Pituitary Gland. No abnormality beyond congestion noted.

Pancreas. Areas of intense polymorphonuclear infiltration with haemorrhage. Pancreatic ducts shewed inspisated secretion. There were areas of necrosis in the parenchyma and an overgrowth of fibrous tissue around and inside lobules.

(Note. I am indebted to Dr. R. F. Ogilvie (Edin.) for the report on the section of the Pancreas.)

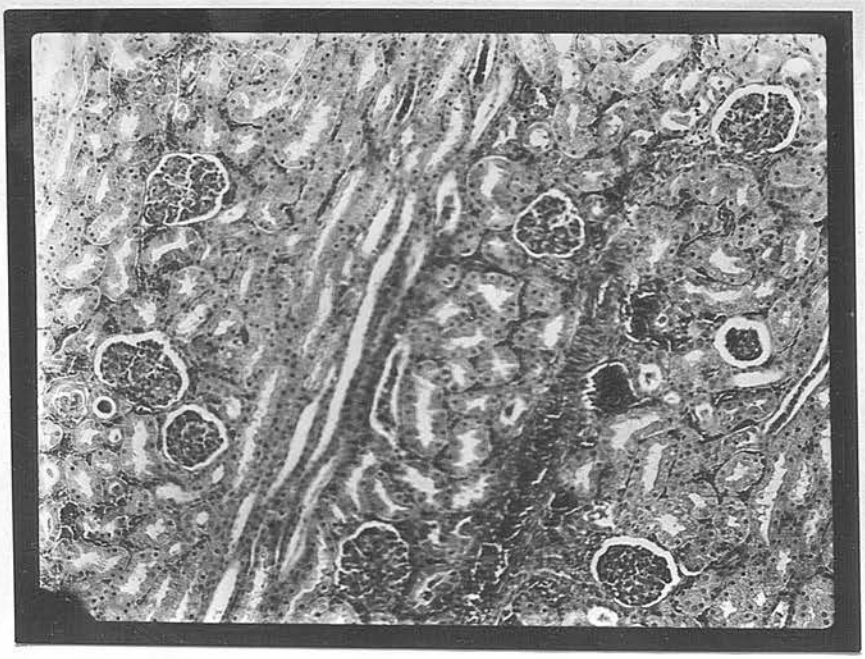
Death was apparently due to pyaemia from acute broncho-pneumonia.

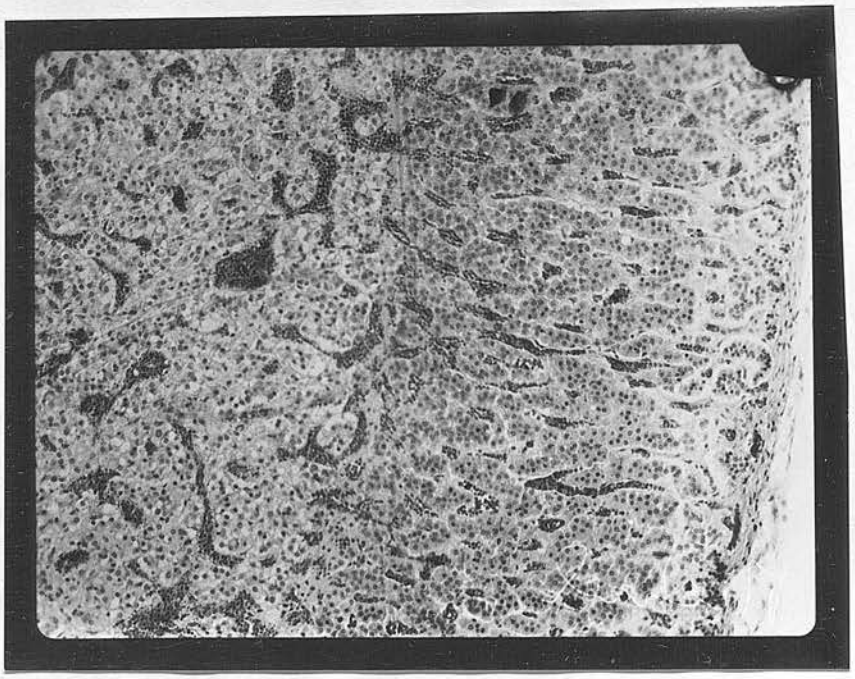


Liver.

CASE No. 19. (x 150 approx.)

Kidney

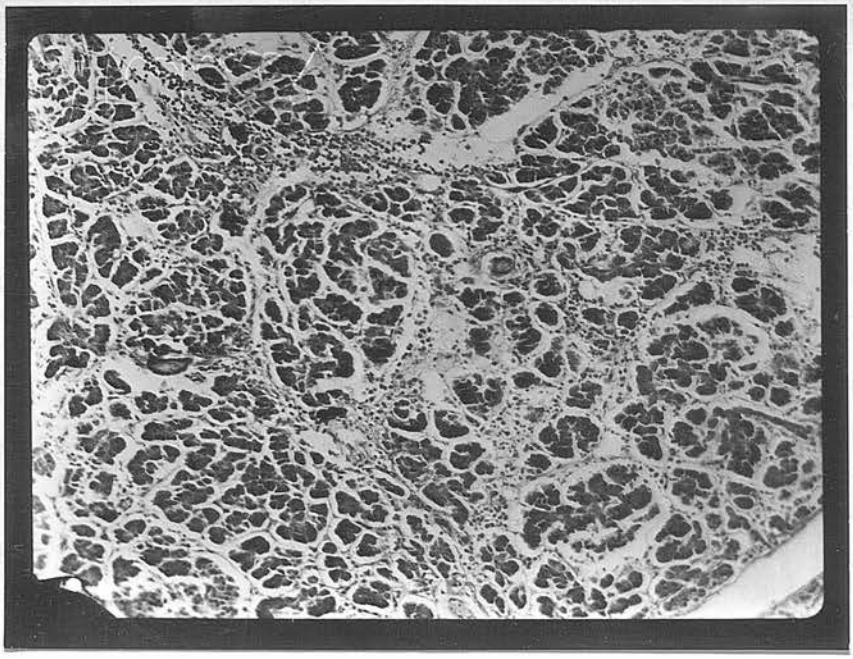




Suprarenal.

CASE No. 19. (x 150 approx.)

Pancreas.



CASE No. 20.

SAMALIYA. (4250) Female. Age: 1½ yrs. Tribe: Bisa.

History.

Past History:-

6.10.48. Treated at Clinic for Boils.

8.11.49. Measles, complicated by broncho-pneumonia. Responded to treatment with Sulphamerazine.

Family History:-

Both parents appear healthy.

Diet:-

Breast milk plus mealie meal porridge.

Present Condition - 27.12.48.

Stated to have had diarrhoea for two weeks. Had not attended the Clinic in that time.

Examination shewed an obviously sick, wasted child with increased pigmentation of the skin of the fronts of thighs, sides of legs and dorsum of feet ("crazy pavement variety"), oedema of the dorsum of the feet and ankles and the vulva and pale rather thin hair. There was cheilosis and angular stomatitis, but no glossitis or stomatitis. The liver was enlarged to two fingers' breadth below the right costal margin, the spleen was not palpable and the heart appeared normal.

Moist crepitations were heard at both lung bases. Stools were frequent and loose and there was marked anorexia and irritability.

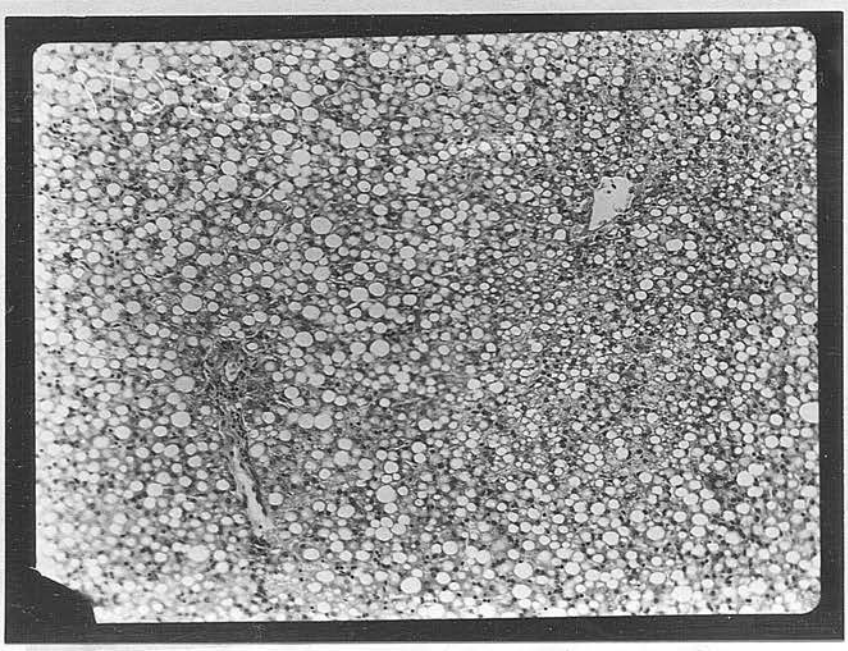
Hospitalisation was refused and the child died on 31.12.48.

Post Mortem - 8 hours after death.

Skin changes and oedema as above with small areas of exfoliation in the perineum and the tops of the thighs. There was an enteritis, an enlarged and fatty liver, and congestion of the lungs and an absence of mesenteric fat.

Micros:-

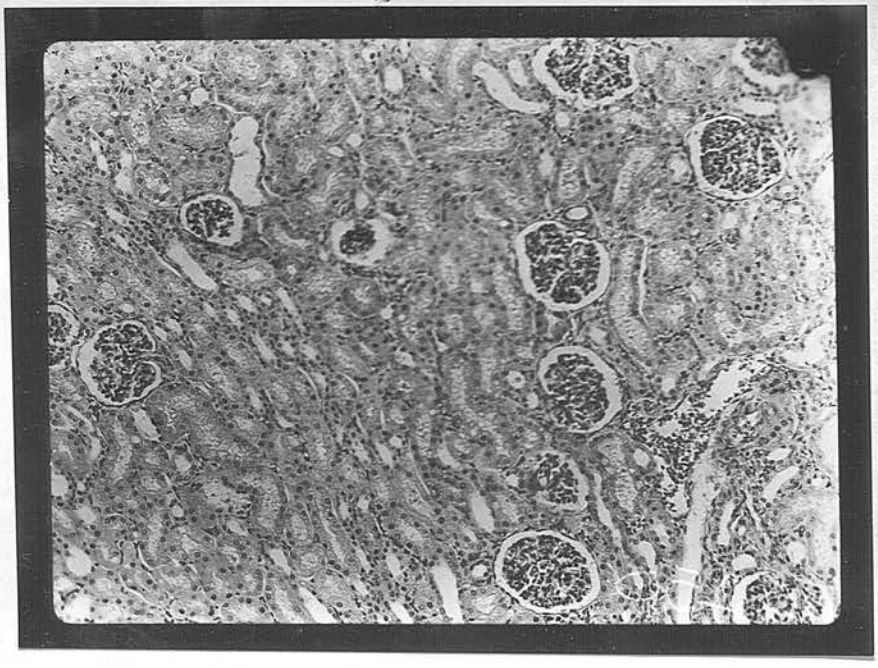
Liver. Gross fatty infiltration involving practically every cell in the liver lobule. The portal tracts shewed round celled infiltration and were well marked.



Liver.

CASE No. 20. (x 150 approx.)

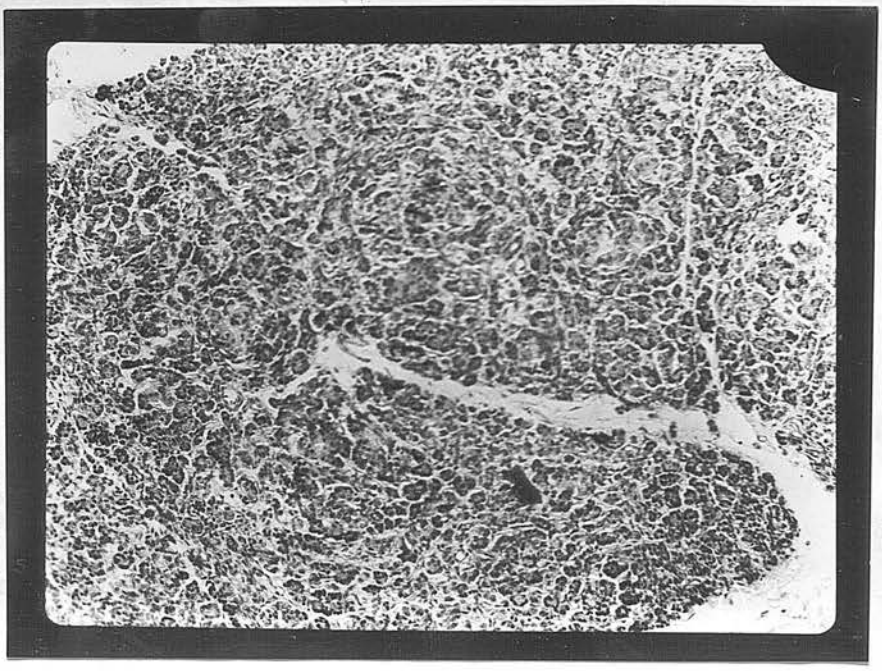
Kidney.



Gut.

CASE No. 20. (x 150 approx.)

Pancreas.



CASE No. 21.

TALIYA. Female. Age: 4 yrs. Tribe: Bisa.

History.

No reliable history of previous illness could be obtained. The mother stated that the present illness commenced with diarrhoea and cough on 10 or 11. 1.49.

Both parents appeared to be healthy. The Child's diet was said to consist of mealie meal porridge, meat and vegetables.

Present condition - 15. 1.49.

An obviously sick and undernourished child with oedema of both feet and ankles, depigmentation of the skin of the perineum and thighs and thin, atrophic pale hair. Moist crepitations were present at both lung bases, the heart was normal, the liver enlarged and palpable two fingers' breadth below the right costal margin and the spleen not palpable.

No abnormality of the central nervous system could be detected. The child resented examination. No malarial parasites were found in the blood and examination of the urine shewed no abnormality. There was no anaemia.

Treatment and Progress.

The diet in Hospital consisted of milk - up to 2 pints daily - plus food yeast 5 Gms. daily. In addition tablets of Vitamin B Complex were administered thrice daily.

16. 1.49. Skin changes more marked. Diarrhoea lessening.

24. 1.49. Recurrence of diarrhoea, which responded to Sulphonamides. Anorexia made it difficult to give more than a very little milk at a time.

28. 1.49. Exfoliation commenced on backs and sides of thighs, backs of legs and around vulva. The hair now appeared to be very scanty and pale and there was pallor of the face. Anorexia more troublesome.

31. 1.49. No improvement.

1. 2.49. Oedema more marked. Died that evening.

Post Mortem - 4 hours after death.

Bronchitis and broncho-pneumonia and an enlarged fatty liver.

The peritoneal cavity contained a small amount of fluid and there was a mild congestion of the walls of the small intestine which appeared to be very thin. There was no mesenteric or omental fat. No cardiac abnormality was found. There was slight oedema of the brain substance.

Micros:-

Liver. Well marked fatty changes most obvious at the periphery of the lobules. Moderate round celled infiltration of the portal tracts but no increase in fibrous tissue seen.

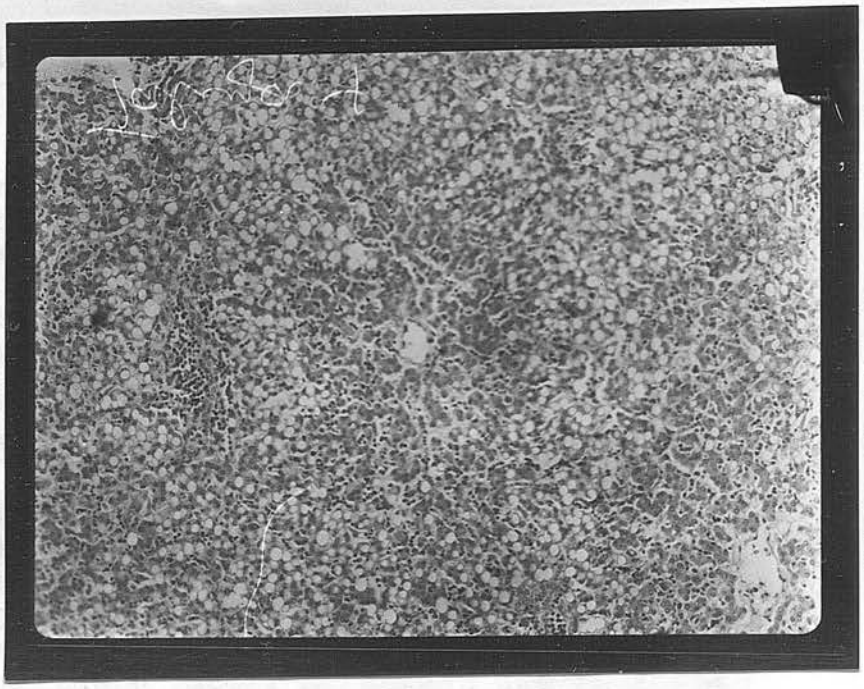
Pancreas. Essentially normal.

Kidney. Patchy congestion. Marked cellular degenerative changes.

Stomach. A few localised areas of round celled infiltration. Slight congestion.

Small Intestine. Congestion and considerable round celled infiltration of muscle layers and mucosa.

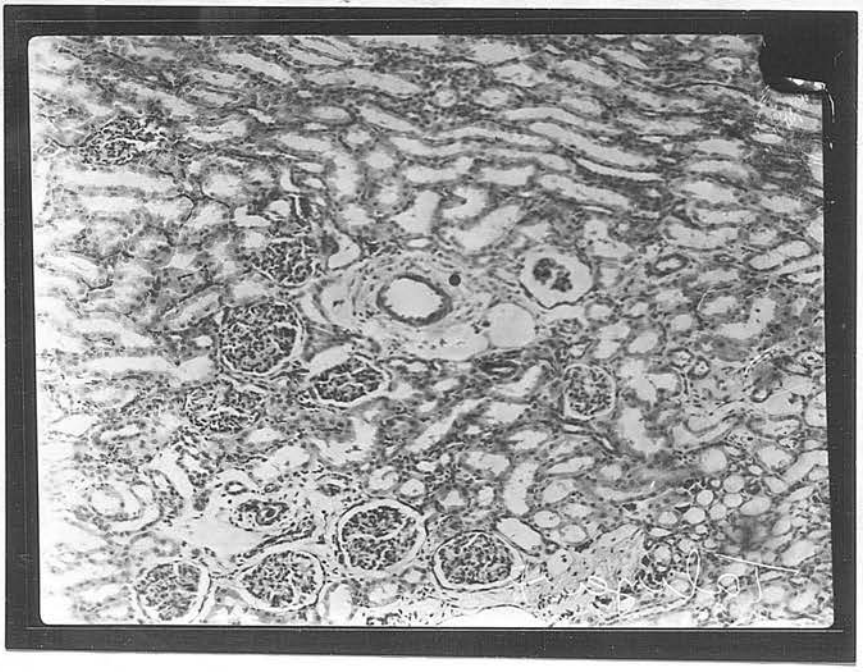
Suprarenal. No obvious pathology.



Liver.

CASE No. 21. (x 150 approx.)

Kidney.



CASE No. 22.

KAKILIFA. (711) Female. Age: 1½ - 2 yrs. Tribe: Bemba.

History.

The child was first seen on 26. 1.49 with a history of repeated attacks of diarrhoea, the present one lasting five days.

Both parents appeared normal. The child was breast fed and also received small amounts of mealie meal porridge.

Present Condition.

An emaciated child with oedema of feet and ankles, pale thin hair which was straighter than normal, and small areas of hyperpigmented skin on the lateral aspects of the legs. The lungs were moist in all areas, the heart appeared to be normal, the liver was palpable rather more than one finger's breadth below the right costal margin, and the spleen was not palpable. No malarial parasites were found in the blood. Temperature, pulse and respiration were normal.

Treatment and Progress.

10 mgms. of Thiamin Chloride were given t.d.s., for three days. Breast feeding was continued and supplemented with about 1½ pints of milk daily.

31. 1.49. Skin appeared to be normal. Only very slight oedema of the dorsum of both feet. The child appeared to be improving.

2. 2.49. The child died suddenly during the night.

Post Mortem examination not performed.

CASE No. 23.

KALUNGA. (5406) Female. Age: 2 yrs. Tribe: Nsenga.

History.

27. 1.49. The child was at its Mother's home (Mkushi district) for three months and returned to Luanshya at the end of December, 1948. It was stated to have been well at home where its diet consisted of mealie meal porridge, fish - about three times a week - pumpkin leaves and sweet potato. After return to Luanshya it became ill with diarrhoea and developed a cough. About a week later the child started to lose portions of its skin. The mother stated that at this time the child's diet consisted of mealie meal porridge, soup made from bones and vegetables, a little meat twice a week, vegetables and some fish.

Family History:-

Both parents healthy. One young child aged 2½ months also healthy.

Present Condition - 27. 1.49.

The accompanying photograph taken on 27. 1.49 shews the skin condition. The hair was thin, pale and scanty and there was oedema of the feet and ankles. There was no stomatitis, glossitis or cheilosis. Moist crepitations were heard at both lung bases, the liver was palpable two fingers' breadth below the right costal margin, the spleen not palpable and the heart appeared to be normal. There was pronounced lethargy but no other sign of nervous involvement. The blood slide shewed the presence of subtertian malaria but temperature, pulse and respirations were normal.

Treatment and Progress.

Treatment consisted of quinine - intramuscularly on the first day , - milk and tablets of Vitamin B Complex one t.d.s. No improvement took place. Anorexia made feeding very difficult and the mother objected to tube feeding. The child became more comatose and died on 4. 2.49.

Post Mortem - 12 hours after death.

Bronchitis, an enlarged and fatty liver, thin translucent small intestines and a complete absence of mesenteric and omental fat. The kidneys, heart, spleen and brain appeared normal.

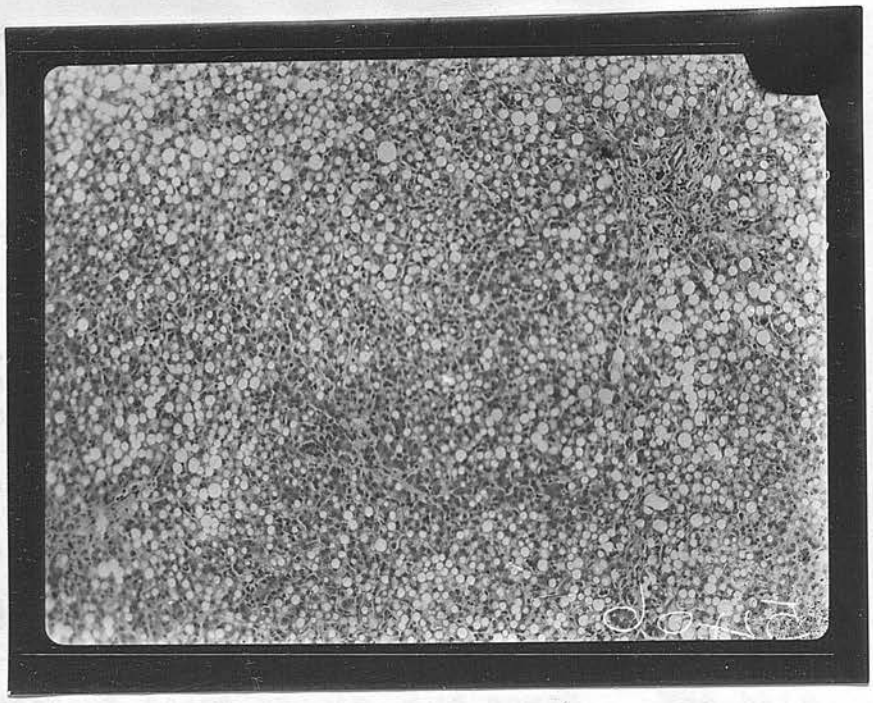
Micros:-

Liver. Extreme fatty changes involving practically every liver cell. Slight round celled infiltration of portal tracts. No obvious increase of fibrous tissue.

Lungs. Bronchiolitis and slight congestion.

Pancreas, Gut, Kidney & Suprarenal. Nil of note.

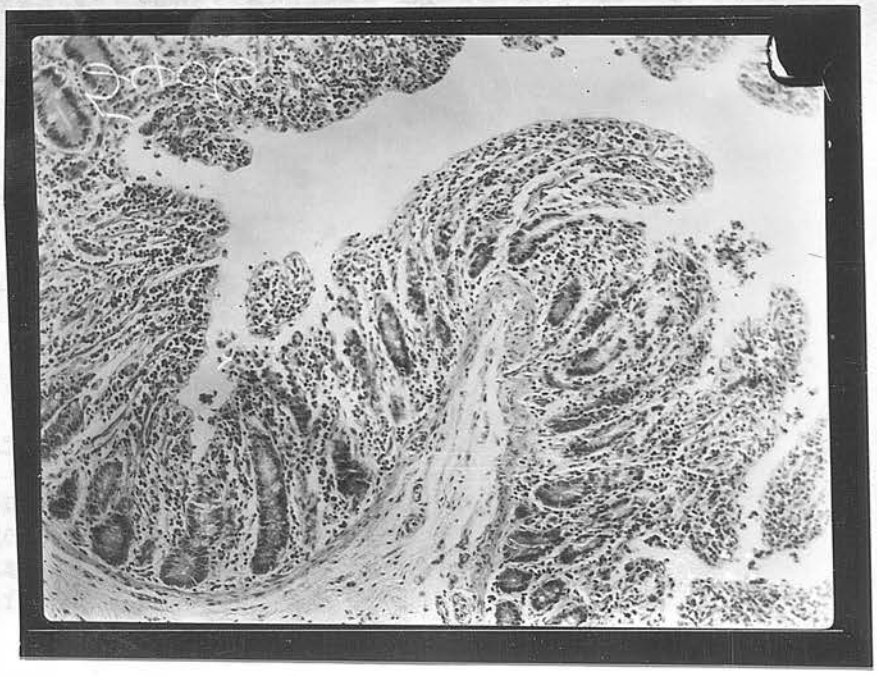
Malignant Malnutrition
Case No. 23.



Liver.

CASE No. 23. (x 150 approx.)

Gut.



CASE No. 24.

KENIFA. (9820) Female. Age: 10 mths. Tribe: Bemba.

History.

Past History:- From Clinic Records.

28.12.48. Gastro-enteritis. Malaria not found.

31.12.48. Improved but general condition poor. Mother asked to bring child daily to the Clinic for extra food.

6. 1.49. Improving.

31. 1.49. No attendance at Clinic for three weeks.

Present Condition. 31. 1.49.

Measles, - said to have commenced seven days ago, before frequent loose stools, and cough. The hair was thin, pale, straight and scanty. There was depigmentation of the skin of the back of the head, and outer parts of the thighs and buttocks and of the lower abdomen. Exfoliation had commenced on the inner parts of the thighs and also the perineum. There were plaques of increased pigmentation on the outer parts of the legs. The perineum, ankles and feet were oedematous. Moist sounds were heard all over the chest, the heart sounds were normal and no cardiac enlargement was detected. The liver was palpable two fingers' breadth below the right costal margin. The spleen was not palpable. The tongue was red and raw looking but there was no angular stomatitis or cheilosis. The child was very lethargic and there was marked wasting. Blood examination for malarial parasites was negative and no urinary abnormalities were found.

Treatment and Progress.

Treatment was attempted with sulphonamides and a milk diet, but the child died on 1. 2.49.

Post Mortem - 4 hours after death.

Broncho-pneumonia with many small lung abscesses, an enlarged fatty liver, congestion of the kidneys, thin translucent small intestines and a complete absence of mesenteric and omental fat.

Micros:-

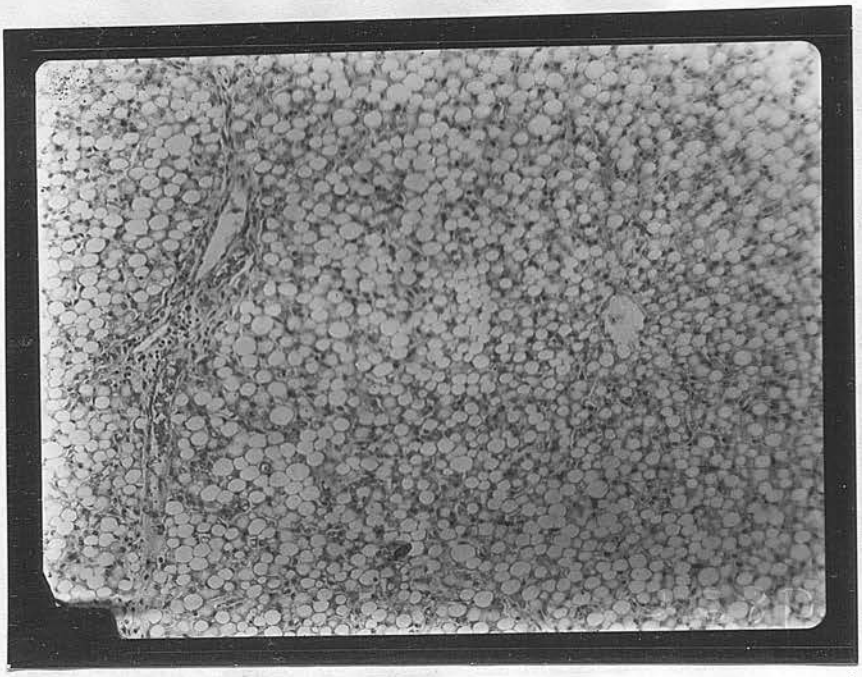
Liver. Extreme fatty changes - lobules could only be recognised by the presence of a central venule, - and patchy round celled infiltration of the portal tracts.

Lungs. Extensive broncho-pneumonia with abscess formation in some areas.

Kidney. Congestion and cellular degenerative changes.

Small Intestine. Moderate diffuse round celled infiltration of mucous membrane with a few round cells in submucous coat and extra peritoneal tissues. Occasional groups of lymphoid cells in the deeper parts of the mucous membrane.

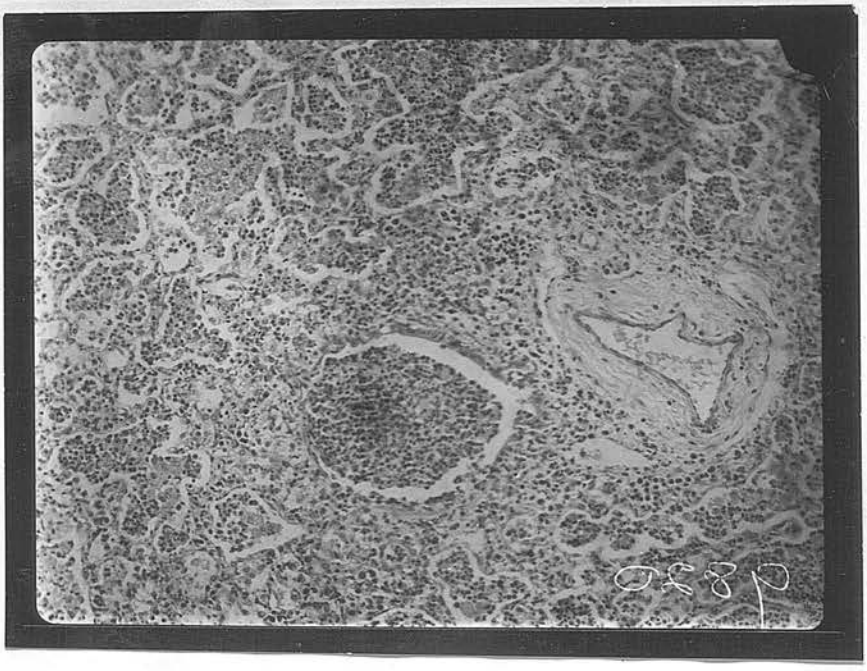
Pancreas and Suprarenal. No obvious pathology.

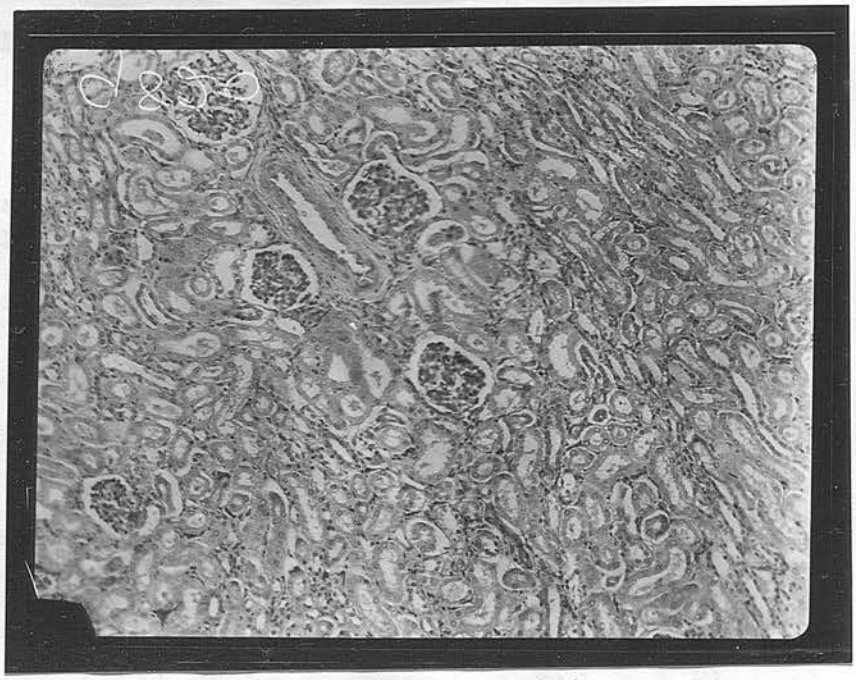


Liver.

CASE No. 24. (x 150 approx.)

Lung.





Kidney

CASE No. 24. (x 150 approx.)

Gut.

CASE No. 25.

MALUMBIKA. Male. Age: 1½ yrs. Tribe: Ngoni.

History.

The child was sent to us from the Government Clinic and no history of previous illness was obtainable. The mother appeared healthy and the patient's diet consisted of breast milk, mealie meal porridge, soup and sometimes vegetables.

Present Condition. 5. 2.49.

An obviously ill child with oedema of feet and ankles; increased skin pigmentation - of the "crazy pavement" type - of buttocks, backs and sides of thighs and outer aspects of legs; pale, scanty and practically straight hair and pronounced lethargy. The liver was palpable two fingers' breadth below the right costal margin, the spleen not palpable and the chest and heart appeared to be normal. There was pyrexia (102°F) and subtertian malaria parasites were found.

Treatment and Progress.

Anorexia and lethargy made oral feeding difficult. Quinine was given (intramuscularly) and as much milk as possible - about a pint a day. In addition the patient received Tablets of Vitamin B Complex one t.d.s. The skin changes became more pronounced, lethargy increased and the child died on 8. 2.49.

Permission for Post Mortem examination was refused.

CASE No. 26.

MUMBI. Male. Age: 1½ - 2 yrs. Tribe: Bemba.

History.

Past History:- From Clinic records.

22. 1.49. Diarrhoea for past seven days. Child dehydrated. Malaria not found. Weight: 17 lbs. 12 ozs.

28. 1.49. General condition poor. Mother instructed to bring the child daily to the Clinic for milk and a meat and vegetable stew plus Tablets of Vitamin B. Complex.

3. 2.49. Attendance irregular, but slow improvement. Weight: 18 lbs.

12. 2.49. Recurrence of diarrhoea. No attendance at Clinic for past week. Weight: 15 lbs.

Family History:-

Nil of note.

Present Condition. 12. 2.49.

An obviously sick dehydrated child with frequent loose stools. Scanty moist crepitations were heard at both lung bases. The liver was palpable one finger's breadth below the right costal margin. The heart appeared to be normal and the spleen not palpable. There were no skin abnormalities, the hair was of good texture and colour but rather scanty. There was no oedema. Blood examination shewed subtertian malaria.

Treatment and Progress.

Treatment was commenced with Quinine - by deep intramuscular injection - and Sulphathiazole Gm. ¼, four hourly. Food was withheld for 24 hours and glucose fluids given. After the first 24 hours the diarrhoea was controlled and milk, 1½ pints daily was given.

19. 2.49. General condition still not satisfactory. Tablets of Vitamin B. Complex, one t.i.d. added. This was later increased to two t.i.d. (22. 2.49.)

22. 2.49. Commencing oedema of the feet and ankles and depigmentation of the skin of the thighs. The hair was noted to be becoming more scanty and finer in texture. Anorexia becoming troublesome.

28. 2.49. General condition much worse. Exfoliation commenced at backs of thighs, buttocks, and outer aspects of legs. Angular stomatitis commencing, hair now definitely paler than normal and becoming more scanty and straighter than normal. Given liver extract by intramuscular injection.

29. 2.49. Liver injection repeated. Child increasingly lethargic. An attempt at feeding by gastric drip was resented by the mother who removed the tube so frequently that eventually the drip was discontinued. (Unfortunately we were unable to remove the mother!)

5. 3.49. Died.

Post Mortem - 12 hours after death.

An enlarged fatty liver, an absence of mesenteric and omental fat, bronchitis and slight oedema of the brain.

Micros:-

Liver. Marked fatty changes.

Lungs. Bronchitis with small areas of bronchopneumonia.

Brain. Oedema with slight congestion. No perivascular cuffing seen.

Kidney. Cellular degenerative changes only.

Pancreas, Suprarenal and Pituitary. No obvious pathology.

CASE No. 27.

MWANSA. (6530). Female. Age: 11 mths. Tribe: Mambwe.

History.

Past History:- From Clinic records.

20.10.48. A normal 7 months old breast fed baby with coryza.

11.12.48. Bronchitis with diarrhoea. Malaria not found.

20.12.48. Improved.

18. 1.49. Recurrence of diarrhoea. Blood slide shewed no malarial parasites.

20. 1.49. Measles rash. Moist crepitations heard in all lung areas. Responded well to treatment with Sulphamerazine.

18. 2.49. Bronchitis. Malaria not found. General condition only fair. Mother instructed to bring the child daily for extra milk and Hake Oil , m. iii. Did not respond to treatment.

Present Condition. 25. 2.49.

Recurrence of diarrhoea. An emaciated looking child with oedema of the feet and ankles and early "crazy pavement" skin on the outer aspects of both legs. The hair was rather pale and scanty. Moist crepitations were heard at both lung bases; no cardiac abnormality could be found; the liver was palpable rather more than one finger's breadth below the right costal margin; the spleen not palpable and there were no signs of disease of the central nervous system. Malarial parasites were not detected in a thick blood film preparation and there was no albumen in the urine.

Treatment and Progress.

The child - still being breast fed - was given one pint of milk daily, plus 2 Gms. of food yeast, 5 mgms. of Thiamin-Chloride, 50 mgms. of Nicotinic Acid and 2 mgms. of Riboflavin. In addition she received Sulphamerazine Gm. ½ eight hourly for five days.

28. 2.49. Condition worse. Stool appeared to be dysenteric. Oedema of feet more marked and slight depigmentation of genital area noted. Hospitalisation was refused. The mother did not attend the Clinic again until 1. 3.49.

On that day the child was obviously moribund with the typical signs of severe malignant malnutrition, viz., depigmentation and exfoliation of the skin of the genital area, buttocks and tops of thighs, oedema of feet and ankles; scanty pale, thin and almost straight hair; glossitis and angular stomatitis, and an enlarged liver.

The child died that day.

Post Mortem examination was not done.

CASE No. 28.

KAOMA. (353(Male. Age: 9 mths. Tribe: Chishinga.

History.

The mother and child arrived in Luanshya from their village on 11. 3.49. Apart from saying that the child had been unwell for three days, the mother could tell us nothing else. The boy's diet was composed entirely of breast milk.

Present Condition. 13 3.49.

A poorly nourished child with depigmentation and patchy exfoliation of the skin of the face, shoulders, arms, chest, back and skull; oedema of the feet and ankles and genital area; angular stomatitis and very scanty pale thin hair.

No cardiac abnormalities detected; moist crepitations heard at both lung bases; spleen not palpable, liver palpable one and a half fingers' breadth below the right costal margin. There was some diarrhoea but no vomiting. No malarial parasites found in a thick blood film preparation and no abnormalities were found in the stool, either on microscopical examination or on culture.

Treatment and Progress.

Treatment consisted at first of milk, one pint a day, plus 25 mgms. of nicotinic acid t.i.d.

16. 3.49. No improvement in general condition. Nicotinic acid stopped and Vitamin B. Complex 2 cc. intramuscularly given daily instead.

21. 3.49. Considerable improvement.

23. 3.49. Skin lesions healing in all areas. Oedema practically gone, but general condition still poor. The Vitamin B injections were stopped the next day as our supply was strictly limited at that time.

28. 3.49. Although skin leasions now healed, general condition still poor.

1. 4.49. Pressure sores commencing on occiput and buttocks. Developed right Otitis Media and commenced to shew patchy exfoliation between the thighs and over the trunk. There was also some increased skin pigmentation over the upper part of the back and around the neck, and return of oedema of the feet and ankles.

The child died that day.

Permission for Port Mortem examination was refused.

CASE No. 29.

MWEWA. (1546) Female. Age: 21 mths. Tribe: Mwanshi.

History.

Past History:- From Clinic records.

6.11.48. Chicken Pox. Recovery uneventful.

6.12.48. Gastro-enteritis.

14. 1.49. Measles, bronchitis and diarrhoea.

20. 1.49. Subtertian malaria.

5. 2.49. Well and improving.

Not seen again until 14. 4.49 when it was said to have been ill for seven days.

Family History:-

Father and mother both appeared well and healthy. Maternal Kahn reaction negative. There were two older children - both healthy- and the mother had had two miscarriages before the birth of this child. Dates could not be obtained and the length of gestation prior to miscarriage could not be ascertained.

Diet:-

The child was being weaned and its diet consisted of mealie meal porridge, soup, potato and a little meat occasionally. The mother's breasts were practically empty.

Present Condition. 14. 4.49.

An obviously sick child with the typical signs of Malignant Malnutrition. The skin shewed "Crazy pavement" areas on the dorsum of both feet, the inner and outer aspects of both legs (especially the outer) and both thighs up to mid-buttock level. Similar smaller areas were seen at the back of the neck and, to a lesser extent, on both arms. Depigmented areas were found between these hyperpigmented patches and in the perineum. The hair was thin, pale and scanty. There was an angular stomatitis and pronounced lethargy. Moist crepitations were heard in most lung areas; no cardiac abnormality was detected; the liver was palpable two fingers' breadth below the right costal margin and the spleen not palpable. Malarial parasites were not found and there was no obvious anaemia.

Treatment and Progress.

Two tablets of Vitamin B Complex were given three times a day, plus about 1 to 1½ pints of milk daily and a little tripe. Anorexia made feeding very difficult.

16. 4.49. Increased exfoliation on the outer aspects of both legs.

17. 4.49. Died.

The child was apyrexial from the time first seen on 14. 4.49.

Post Mortem - 8 hours after death.

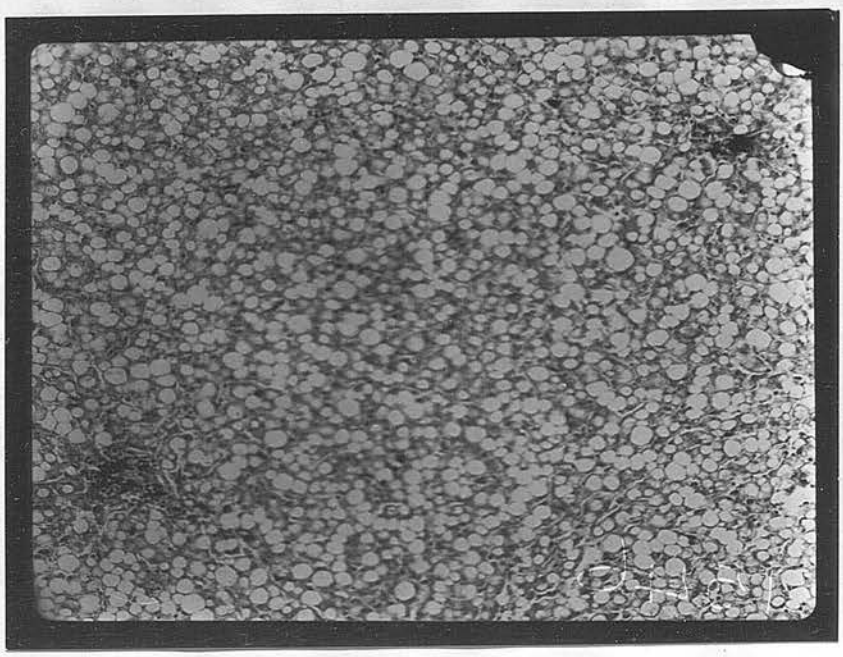
Broncho-pneumonia, an enlarged and fatty liver and a complete absence of mesenteric and omental fat. No other abnormalities were found.

Micros:-

Liver. Gross fatty changes involving practically the whole of the section. Round celled infiltration of the portal tracts which also contained a few pigment filled macrophages.

Kidney. Cellular degenerative changes and patchy congestion.

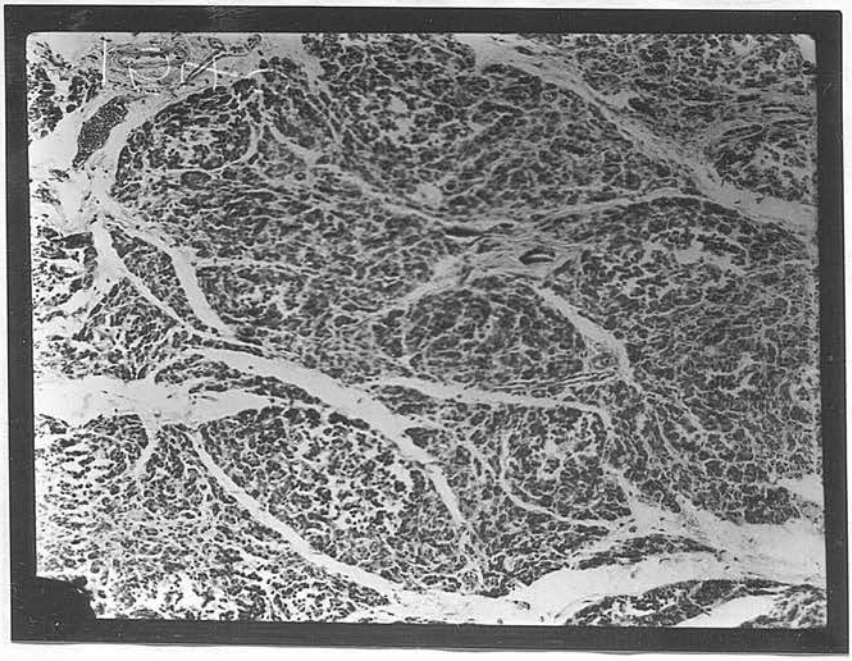
Pancreas and Suprarenal. Nil of note observed.

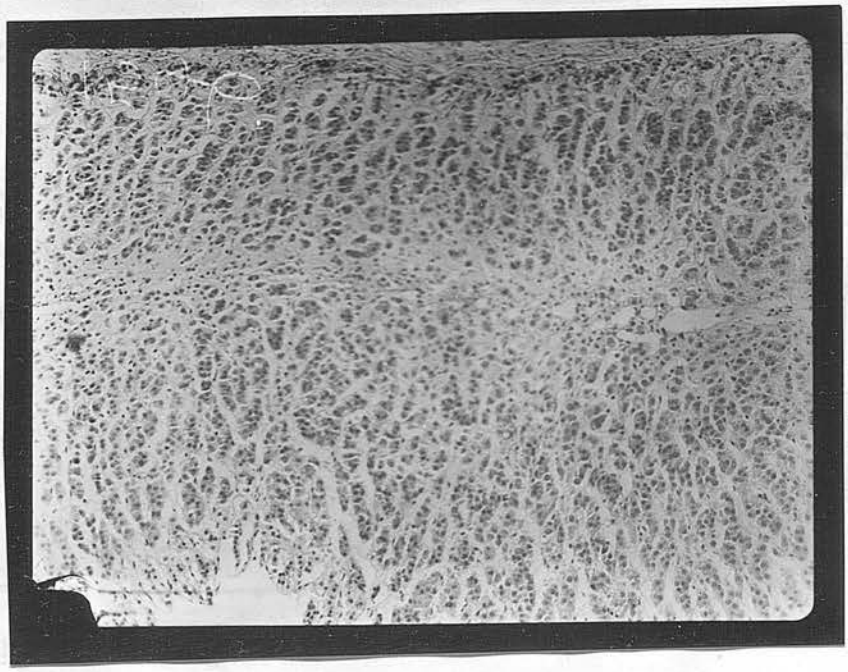


Liver.

CASE No. 29. (x 150 approx.)

Pancreas.

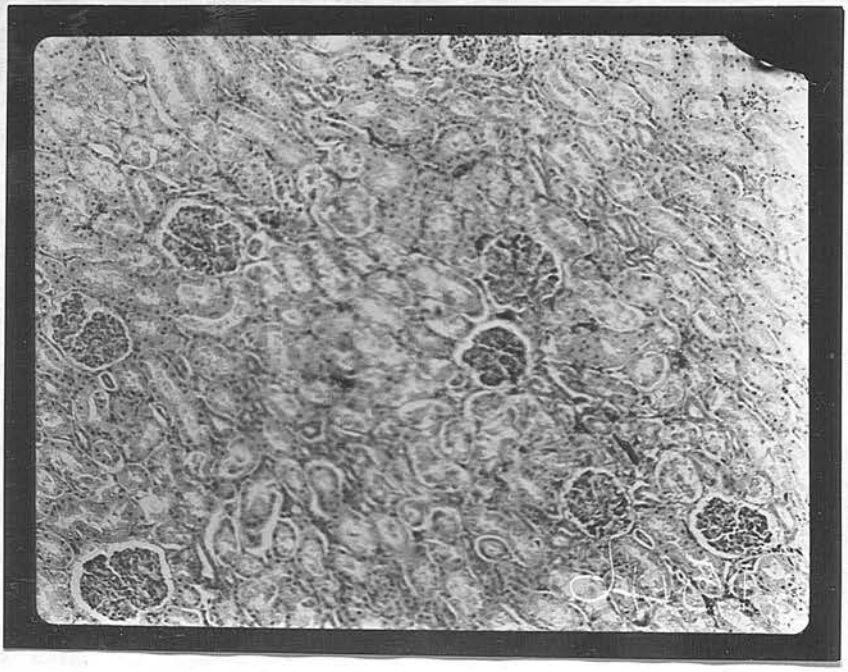




Suprarenal.

CASE No. 29. (x 150 approx.)

Kidney.



CASE No. 30.

KALUNGA. (3388) Female. Age: 1½ - 2 yrs. Tribe: Bisa.

History.

No history of past illness obtainable up to 8. 5.49, when the child was first seen at one of our Clinics. At that time the child had broncho-pneumonia and severe diarrhoea. She was treated in hospital amd the response was satisfactory.

Family History:-

Nil of note.

Diet:-

Breast milk plus mealie meal porridge and soup.

Present Condition. 2. 6.49.

Routine examination at the Clinic disclosed slight oedema of both feet and ankles and a palpable liver. There was no stomatitis or angular stomatitis. The hair appeared to be quite normal and no skin changes were seen. There was no malaria and no abnormalities of chest and heart were found. The urine contained no albumen. Weight: 16 lbs.

Treatment and Progress.

The mother was asked to bring the child daily to the Clinic for extra food which consisted of one pint of milk daily and a reasonable helping of a minced meat and vegetable stew. In addition, she was given three tablets of Vitamin B Complex a day.

8. 6.49. Weight: 16 lbs. 12 ozs. Oedema still present and no improvement in general condition. No skin changes were seen but the hair was becoming pale and thin. The liver was now palpable two fingers' breadth below the right costal margin. The child was very irritable but feeding well.

11. 6.49. Slight desquamation of skin of outer borders of feet.

13. 6.49. Increase of oedema. Hair more scanty and very thin. Weight: 17 lbs. 2 ozs. (? Due to increase of oedema). Skin now shewing "crazy pavement" areas on the dorsum of the feet, around the ankles and on the lateral aspects of both legs. (N.B. Tabs. Vitamin B Complex started 2. 6.49.)

16. 6.49. Weight stationary. Oedema still present and the slight skin changes.

24. 6.49. Weight still 17 lbs. 2 ozs. Commencing exfoliation of skin of ankles and legs.

28. 6.49. Weight: 15 lbs. 4 ozs. Skin changes more marked on legs and appearing on back. Liver palpable two fingers' breadth below the right costal margin. Spleen not palpable. Heart, N.A.D. Chest, moist crepitations at both lung bases. Hair pale and scanty. Conjunctivitis of both eyes. Urine, N.A.D. Child very irritable. Tabs. Vitamin B Complex stopped and also the minced meat dish. Instead she was given as much milk to drink per day as she could manage, i.e., between 1 and 1½ pints.

4. 7.49. Weight: 16 lbs. 4 ozs. General condition much worse. Oedema now extending up legs. The hair was very scanty and of poor texture and quite straight. The skin changes on feet, legs and back were extending. The mother now agreed to the child being brought into hospital.

X-ray of chest shewed no abnormality, as did an examination of the urine and a blood slide. There was some anaemia:-

R.B.Cs. 4,410,000 per cmm. Haemoglobin: 67·9% or
C.I. 0·77. 10·4 Gms. %.

No tubercle bacilli were found in preparations of urine and faeces.

Iron was given orally (Ferrous Sulphate gr. 3 b.d.) and the mother was encouraged to give the child frequent small milk feeds. In spite of all efforts however, we found that the child was getting a little less than 1 pint of milk daily. Although she still attempted to feed from her mother's breasts, we felt that she could have obtained very little from that source. The mother would not let us try feeding by gastric drip.

21. 7.49. There did not appear to have been any improvement and the mother refused to allow the child to stay in hospital any longer. In spite of this, however, she attended pretty regularly at the Clinic for extra food for her child. (Milk and minced meat.)

25. 7.49. Weight: 15 lbs. 8 ozs. Skin changes less marked but facial oedema now seen below the eyes.

28. 7.49. Although the skin was looking more normal the child's general condition appeared to be much worse. She was very lethargic and oedema was more marked. The liver was now palpable three fingers' breadth below the right costal margin.

1. 8.49. Weight: 16 lbs. 4 ozs. Condition unchanged. Vitamin B Complex again started (3 daily). Milk and meat continued.

8. 8.49. Child getting steadily worse. Vitamin B tablets obviously not helping and stopped.

15. 8.49. Weight: 15 lbs. 8 ozs. Slight lessening of oedema. Practically no hair on head, but skin lesions healing.

19. 8.49. Oedema very much less. Appetite increased enormously. Child very irritable.

22. 8.49. Weight: 16 lbs. 8 ozs.

25. 8.49. Oedema practically gone from limbs but still present below eyes. The mother said that she was giving the child three eggs a day, mealie meal porridge, soup and vegetables in addition to the milk (over one pint a day) and mince we were giving her at the Clinic.

29. 8.49. Weight stationary but improvement continuing. Hair commencing to grow again.

5. 9.49. I. S. Q.

12. 9.49. Weight: 17 lbs. 8 ozs. Child taking considerably more interest in life. Very slight oedema of legs and rather more below eyes. Hair more conspicuous but "gingery" Skin normal. Liver edge less than two fingers' breadth below the right costal margin. Chest, heart and spleen N.A.D. Limbs very thin.

3.10.49. No oedema of legs and very slight oedema of lower eye lids. Still improving.

17.10.49. Weight: 17 lbs. 12 ozs. Hair growing in nicely and beginning to become black and to curl.

31.10.49. Weight: 18 lbs. 4 ozs. Hair improving still. Appears quite normal.

14.11.49. No abnormality detected. Weight: 18 lbs. 8 ozs.

CASE No. 31.

ALUBETI. (4475). Male. Age: 1 yr. Tribe: Kachokwe.

History.

Past History:- from Clinic records.

5. 8.48. (Age 3 months.) Coryza.

29. 8.48. Bronchitis.

29.11.48. Bronchitis and gastro-enteritis. Malaria not found. Responded readily to treatment.

8.12.48. Conjunctivitis.

15.12.48. Measles. Sulphamerazine Gm. ½ given twice daily for five days as a prophylactic measure. Recovery uneventful.

9. 2.49. Gastro-enteritis which continued intermittently to

25. 2.49. when the stools became frankly dysenteric. Dysentery rapidly controlled with Sulphaguanidine which was given for five days.

29. 4.49. Recurrence of diarrhoea.

Family History:-

Nil of note.

Diet:-

Breast fed. Receiving a little mealie meal porridge in addition.

Present condition. 16. 5.49.

Admitted to hospital with a history of diarrhoea for five days. The child was apyrexial and neither emaciated nor dehydrated. Both skin and hair were normal in appearance. A few moist crepitations were present at both lung bases; no cardiac abnormalities were found; the spleen was not palpable but the lower edge of the liver could be felt just below the right costal margin.

Treatment and Progress.

Glucose fluids were given for 24 hours, and thereafter milk. In addition the child received Sulphapyridine Gm. ¼ four hourly for five days.

19. 5.49. No diarrhoea. Taking milk well.

23. 5.49. Sudden severe relapse of gastro-enteritis. On that day hyperpigmented areas were found on the skin of the face and there was also slight depigmentation of the skin of the scrotum and perineum and the tops of the thighs. No oedema was present but the liver was now palpable one finger's breadth below the right costal margin. Malarial parasites were not found.

24. 5.49. Commencing depigmentation of the skin of the face. No oedema. No hair changes. Anorexia.

26. 5.49. Diarrhoea controlled. Anorexia troublesome.

28. 5.49. Depigmentation of skin of face and genital area more marked. Becoming increasingly lethargic. Liver enlarging slowly.

30. 5.49. Died.

Post Mortem - 12 hours after death.

Early broncho-pneumonia, an enlarged fatty liver, slight congestion of the small intestine and stomach and an absence of mesenteric and omental fat.

Micros:-

Liver. Well marked fatty changes most obvious at periphery of liver lobules. Slight congestion. Round celled infiltration of portal tracts.

Lungs. Bronchiolitis with small areas of peribronchial consolidation.

Pancreas, Spleen, Kidney and Suprarenal. Nil of note.

CASE No. 32.

DAUTI. (3572) Male. Age: 1½ yrs. Tribe: Bemba.

History.

Past History:-

The mother stated that the child had been well until the beginning of April, 1949. From then until seen on 22. 5.49, he had had repeated attacks of diarrhoea with some coughing. There had been an occasional attendance at one of our Clinics. In January 1949 the boy had weighed 18 lbs.

Family History:-

Nil of note.

Diet:-

Breast milk only. (This statement - made by the mother - was almost certainly untrue.)

Present Condition - 22. 5.49.

A poorly nourished, dehydrated child with mild pellagrinoid skin changes of the dorsum of both feet and the outer aspects of both legs. Pitting oedema was found at the ankles and on the dorsum of the feet. The hair appeared to be normal in texture, but a little pale. There was no angular stomatitis or glossitis. Moist crepitations were heard all over both lungs, the liver was palpable just over a finger's breadth below the right costal margin, the spleen not palpable and no cardiac abnormality was detected. The stools were loose and frequent. A blood slide shewed the presence of moderate numbers of subtertian malarial parasites. Weight: 15 lbs.

Treatment and Progress.

The child was given Paludrine 0.1 Gm. daily for ten days after an initial intramuscular injection of quinine gr. 5: Sulphamerazine Gm. ½, eight hourly for five days, and glucose fluids.

24. 5.49. Not dehydrated. No diarrhoea. Now being given one pint of milk daily and minced meat and vegetable stew at the Clinic.

27. 5.49. Oedema of feet much less pronounced. Chest practically clear.

30. 5.49. Skin changes improving. Slight oedema still present.

6. 6.49. No oedema. Skin normal Weight: 16 lbs. The mother continued to bring the child to the Clinic daily for extra food.

3.10.49. Child appears normally healthy. The liver, however, was still palpable just below the right costal margin.

CASE No. 33.

TERESA. Female. Age: 1 yr. Tribe: Bisa.

History.

1. 7.49. Reported to have had intermittent attacks of diarrhoea for the last six weeks. The child was entirely breast fed and the mother appeared to be healthy.

Present Condition - 1. 7.49.

An undernourished, but not dehydrated, child with small areas of hypo and hyperpigmentation of the skin of the feet and legs. There was no oedema, angular stomatitis or glossitis. The hair was scanty, thin and pale in colour. Moist crepitations were heard throughout both lungs and the liver was palpable below the right costal margin. The child was rather irritable. No other abnormality was found and malarial parasites were not present in a thick blood film preparation.
Weight: 12 lbs. 8 ozs.

Treatment and Progress.

Sulphamerazine Gm. ½ b.d. for five days. Milk one pint and minced meat and vegetable stew daily at Clinic. Tablets of Vitamin B Complex two daily for ten days.

14. 7.49. Weight: 13 lbs. 8 ozs. Improving.

4. 8.49. Weight: 15 lbs. Skin quite normal, hair still pale and scanty. Liver still palpable.

8. 9.49. Attendance at Clinic very irregular for past two weeks. Now found to have diarrhoea. Weight: 14 lbs. 12 ozs. Recurrence of "Crazy Pavement" skin of feet and legs. No oedema. Hair pale and scanty. Liver palpable a little more than one finger's breadth below right costal margin.

14. 9.49. General condition unchanged, but diarrhoea ceased. Still not attending regularly. Weight: 14 lbs. 14 ozs.

3.10.49. Weight: 15 lbs. 10 ozs. Skin practically normal. Hair becoming normal. Liver still palpable.

17.10.49. Still improving. Weight: 16 lbs.

7.11.49. Skin and hair quite normal in appearance. Weight: 16 lbs. 6 ozs. Liver barely palpable below right costal margin.

CASE No. 34.

MWANZA. (6281) Female. Age: 1¼ yrs. Tribe: Nsenga.

History.

The child was first seen on 27. 5.49. According to the mother it had been suffering from cough and diarrhoea for seven days previously, but had had no other illnesses. She was being fed on breast milk, mealie meal porridge, bread and a little meat three times a week. Both parents were healthy as was one older child. One other child had died at about six months age from what appeared to have been meningitis.

Present Condition.

An emaciated rather irritable child with three upper and two lower teeth. There was obvious oedema of the feet, ankles, and genital area with depigmentation of the skin of the thighs and perineum and patches of "crazy pavement" hyperpigmentation on the outer aspects of both legs. The hair was thin, pale, scanty and practically straight. A few moist crepitations were heard at both lung bases and the liver was palpable two fingers' breadth below the right costal margin. The spleen was not palpable, no cardiac abnormality was found and no malarial parasites. The child weighed 13 lbs. 4 ozs.

Treatment and Progress.

Breast feeding was continued and in addition the child was given one pint of milk a day and a little tripe. The stools at first were frequent but rapidly became normal without specific treatment. The appetite was poor.

3. 6.49. Very little change in general condition. Skin changes rather more marked.

6. 6.49. Oedema diminishing and skin changes halted. Appetite improving.

10. 6.49. No oedema found. Skin looking normal and child taking very much more interest in its food.

13. 6.49. Weight: 16 lbs. No oedema. Liver diminishing in size. Skin much improved. Hair still appears thin, scanty and pale. Patient discharged at mother's request, but she promised to bring her daily to the Clinic for milk and meat.

Follow-up:-

Improvement continued and weight gained steadily.

20. 9.49. Weight: 20 lbs. 4 ozs. A normal healthy looking child except for rather gingery hair and a palpable liver.

3.10.49. Weight: 20 lbs. 12 ozs.

CASE No. 35.

KANYATA. (10008) Male. Age: 15 mths. Tribe: Bemba.

History.

The child was first seen by me on 30. 5.49. It had then been living in Luanshya for three months. Before coming to Luanshya he had had several attacks of diarrhoea but had none since up to 23. 5.49. On that day the child was brought to one of our Clinics and was found to have malaria (subtertian) which responded readily to treatment with quinine. Both parents seemed to be healthy and there were no other children. The boy's diet consisted of breast milk only.

Present Condition - 30. 5.49.

A sick but not dehydrated child with a temperature of 101°F. There were frequent loose stools. The skin shewed depigmentation in the genital area and in patches on the upper and outer parts of the legs. On the face there were both depigmented and hyperpigmented areas and, in places, some scaling. The hair was thin, pale and scanty and oedema was found at both ankles and on the dorsum of the feet. Moist crepitations were heard at both bases; the liver was palpable two fingers' breadth below the right costal margin but no abnormality of heart or spleen could be detected. There was no obvious anaemia and no malarial parasites were found in a thick blood film preparation. The child had four upper teeth and two lower teeth, and weighed 18 lbs. 4 ozs.

Treatment and Progress.

In view of the recent history of malaria, Paludrine 0.1 Gm. was given daily for seven days. In addition, Sulphamerazine Gm. ½ was given every 12 hours for five days.

Breast feeding was supplemented with about one pint of milk daily. Diarrhoea rapidly subsided, the child became apyrexial on 2. 6.49 and remained so thereafter.

10. 6.49. Oedema completely gone. Skin of face, genital area and limbs obviously improved. Hair still scanty and rather pale.

13. 6.49. Weight: 19 lbs. 8 ozs. Seemed quite recovered. Liver palpable one finger's breadth below the right costal margin.

Discharged at mother's request; to attend Clinic daily for extra nourishment.

Follow-up.

The mother continued to attend the Clinic regularly for extra food for the child and he gained steadily in weight. On 22. 9.49 he weighed 22 lbs. and appeared to be a perfectly normal child.

The liver was not palpable.

CASE No. 36.

CHIPULU. (5007) Female. Age: 1½ - 2 yrs. Tribe: Ngumbo.

History.

The child was first seen on the day of its death, 25. 6.49. The mother stated that the girl had been well until five weeks ago when she had developed measles from which she never fully recovered. Both parents appeared to be healthy, the mother being six weeks pregnant. The child's diet consisted of breast milk and mealie meal porridge.

Examination revealed an emaciated child with pronounced lethargy and gross oedema of the legs and ankles. The skin shewed "crazy pavement" areas over most of the legs, the outer aspects of the thighs, forearms and arms, the back of the neck and the upper half of the back, and small patches were present on the lower abdomen. Exfoliation was found on the dorsum of the feet and around the ankles. The hair was scanty, fine and almost straight.

Moist crepitations were heard in all lung areas; no cardiac abnormality was found; the spleen was not palpable and the liver was palpable two fingers' breadth below the right costal margin. There was no glossitis, stomatitis or cheilosis.

The child died a few hours later.

Post Mortem - 10 hours after death.

Slight ascites, bronchitis, an enlarged and fatty liver, an absence of mesenteric and omental fat. The gut walls were practically transparent. There was no cardiac abnormality. The brain was oedematous.

Micros:-

Liver. Moderate fatty changes involving about one-third of each liver lobule and most marked at the periphery of the lobules. The central venules were congested as were the vessels in the portal tracts which shewed a round celled infiltration. No increase of fibrous tissue could be detected.

Kidney. Congestion and cellular degenerative changes.

Pancreas and Suprarenal. Nil of note.

CASE No. 37.

CHISENGA. (5759) Male. Age: 19 mths. Tribe: Bisa.

History.

The child was born and had lived all the time at Luanshya. The mother stated that it had been quite healthy until a month before being seen first when it had started to have intermittent diarrhoea.

On 27. 8.49 he was seen at one of our Clinics and found to have a mild gastro-enteritis which responded readily to simple treatment. Weight: 14 lbs. 12 oz.

Owing to the child's undernourished appearance the mother was instructed to attend daily at the Clinic so that we could give him milk and minced meat and tablets of Vitamin B. Complex. He was seen again on 8. 9.49 and thought to be improving.
Weight: 16 lbs.

Family History:-

Both parents healthy. Mother two months pregnant.

Diet:-

Breast milk and mealie meal porridge.

Present Condition -- 13. 9.49.

No attendance at Clinic for last four days. Has had severe diarrhoea during this time. Examination shewed slight oedema of feet and ankles and early "crazy pavement" changes of the skin of the feet and outer aspects of both legs. There was no exfoliation, stomatitis or glossitis and the hair was fairly normal. The liver was palpable one finger's breadth below the right costal margin. No abnormality of chest, heart or spleen was found.
Weight: 16 lbs.

Treatment and Progress.

A simple astringent mixture was given to control the diarrhoea and the necessity for regular attendance at the Clinic again impressed on the mother. At the Clinic the child received milk - ad lib - and Tabs. Vitamin B. Complex, three daily.

15. 9.49. Diarrhoea stopped. Weight: 16 lbs. 12 ozs. General condition unchanged.

19.19.49. Recurrence of diarrhoea. Chest moist at both lung bases. Weight: 15 lbs. 14 ozs. Hair now "gingery" in colour and falling out. Skin changes rather more marked and oedema still present. Sulphamerazine Gm. ½ b.d. for five days given.

3.10.49. No further attacks of diarrhoea. Heart, spleen and chest N.A.D. Liver still palpable one finger's breadth below the right costal margin. Skin quite healthy but hair still "gingery" although growing again. Weight: 16 lbs. 10 ozs. No oedema detected.

17.10.49. No significant change.

20.11.49. General condition better. Weight: 17 lbs. Liver palpable less than one finger's breadth below the right costal margin. Hair practically normal.

CASE No. 38.

KUNDA. (6937) Male. Age: 2½ - 3 yrs. Tribe: Bisa.

History.

The child was first seen on 20. 6.49 and the mother could tell us little of the boy's past illnesses beyond the fact that he had had diarrhoea for three days and had been living in Luanshya for two months.

The mother was healthy and there were no other children.

The child's diet was stated to consist of breast milk and mealie meal porridge, but it was felt at the time that this statement, like most of the other things the mother told us, was completely unreliable. The mother's breasts were practically empty.

Present Condition - 20. 6.49.

Examination shewed an obviously undernourished child considerably lighter in colour than normal. The skin of the outer part of the legs and thighs shewed small patches of "crazy pavement" changes. The hair was pale in colour, thin and practically straight and scanty. Moist crepitations were present at both lung bases and the liver was palpable almost two fingers' breadth below the right costal margin. The spleen was not palpable and no cardiac abnormality was found. There was no oedema. The boy was irritable on examination and weighed less than 18 lbs. No malaria parasites were found in a thick blood film preparation, and the urine was normal.

Treatment and Progress.

The diarrhoea responded to simple measures and thereafter the child was given as much milk as he could take. Anorexia made this a little more than one pint a day. He continued to suck at his mother's practically empty breasts.

In spite of this the child's general condition improved and he even put on weight, weighing 18 lbs. 12 ozs. on 27. 6.49. In the next few days there was further improvement and the appetite was increasing steadily.

2. 7.49. Became pyrexial and found to have crepitations at both lung bases and an irritating cough. Gm. ¼. of Sulphathiazole was given four hourly for five days with improvement.

11. 7.49. Weight: 17 lbs. 8 ozs.

12. 7.49. Again pyrexial. Started to have loose green stools, and moist crepitations at both lung bases. Given Penicillin by intramuscular injection, 10,000 units three hourly.

14. 7.49. Apyrexial. Diarrhoea controlled. Liver palpable two fingers' breadth below the right costal margin. Spleen palpable on inspiration. Chest still moist and cough troublesome. Hair becoming very scanty and thin. Skin changes re-appearing with marked facial pallor. No oedema found and no malarial parasites in two thick blood film preparations. X-ray of chest shewed an ill-defined opacity accupying the right mid-lung zone from the hilum almost to the periphery. Repeated stool examinations failed to reveal tubercle bacilli and it was decided that the child had a primary atypical pneumonia. Penicillin was continued and the child encouraged to drink as much milk as he could and was given small quantities of well-cooked meat too.

20. 7.49. Still apyrexial but general condition worse. No oedema developed and skin changes neither improved nor worsened. Weight: 16 lbs. 8 ozs. Tablets of Vitamin B. Complex added. (Three daily.)

25. 7.49. The mother had by now given up all hope of her child recovering and removed him from hospital.

29. 7.49. Attended one of our Clinics. Mother asked to bring boy daily so that we could continue extra nourishment and Vitamin B. tablets.

4. 8.49. Weight: 14 lbs. 2 ozs. Apyrexial. Hair "gingery" and thin. Skin changes as before. Liver palpable two fingers' breadth below the right costal margin. Moist crepitations still heard at both lung bases.

15. 8.49. Weight unchanged but child's appetite improving.

25. 8.49. Weight: 14 lbs. 8 ozs.

1. 9.49. Weight: 15 lbs. 8 ozs. Obvious improvement in general condition and in appetite. Still very thin and skin condition unchanged.

8.,9.49. Weight: 16 lbs. 2 ozs.

20. 9.49. Weight: 16 lbs. 12 ozs. Still has moist crepitations at lung bases and liver still palpable two fingers' breadth below right costal margin. "Crazy pavement" skin of outer border of legs still present but no oedema found. Hair now fairly abundant although still pale and rather fine texture.

The child was attending regularly and drinking one pint of milk daily as well as eating a good helping of minced meat and vegetables. (This was, of course, quite apart from what he received at home.)

He continued to improve steadily to 20.10.49 when he left Luanshya. He then weighed 21 lbs. 6 ozs. Appeared to be quite normal except that his liver was still palpable one finger's breadth below the right costal margin.

CASE No. 39.

TAZGANI. (2276) Male. Age: 14 mths. Tribe: Tumbuka.

History.

Past History:- from Clinic records.

14. 6.48. Coryza.

24. 8.48. Conjunctivitis.

2.11.48. Otitis Media.

7.11.48. Gastro-enteritis.

5.12.48. Conjunctivitis. (Severe).

6. 1.49. Conjunctivitis. (No evidence of Trachoma.)

5. 9.49. Bronchitis, diarrhoea and vomiting. Found to have subtertian malaria in addition. Treatment given with Sulphamerazine Gm. ½ twice daily and quinine intramuscularly, followed by Paludrine for 7 days. (0.2 Gm. daily.)

14. 9.49. Recurrence of diarrhoea which continued intermittently to 19. 9.49 and then recurred on 21. 9.49.

Family History:-

Nil of note.

Diet:-

Breast milk and mealie meal porridge.

Present condition - 21. 9.49.

Examination shewed an obviously undernourished and dehydrated child with oedema of the feet and ankles and scanty, straight and very short gingery hair. The child, although of pure Bantu descent, presented the "coffee colour" appearance normally associated with 'half-caste' children. The skin of the outer aspects of legs and arms shewed areas of "crazy pavement" changes. The liver was palpable one finger's breadth below the right costal margin, and the spleen not palpable. No cardiac abnormality was found; a few moist sounds were heard at both lung bases. The child weighed 14 lbs. 12 ozs. There was no stomatitis, glossitis or obvious anaemia. A moderately severe diarrhoea was present.

Stool examination shewed the presence of Mucus and a few degenerate leucocytes only. No pathogenic coliform bacilli were grown on culture.

Urine examination (non-catheter specimen). The reaction was Acid. Albumen three plus; Pus cells three plus; scanty Red Blood Cells and granular casts. A stained film shewed numerous coliform bacilli.

No malaria parasites were found in a thick blood film preparation.

Treatment and Progress.

Sulphamerazine Gm. ½ eight hourly for five days, plus a simple alkaline mixture.

Fluids only were given for the first 24 hours, and thereafter breast feeding was supplemented with one pint of milk a day.

23. 9.49. Anorexia marked. Stools still loose though less frequent. Received Riboflavine 10 mgms. by intramuscular injection.

24. 9.49. Apyrexial. Riboflavine injection repeated. Stools still loose.

25. 9.49. Injection of Riboflavine repeated. Anorexia still marked. Oedema still present. Only one bowel motion in preceding 24 hours.

26. 9.49. Anorexia still marked. Vomited several times.

28. 9.49. Recurrence of diarrhoea. Given 250 ccs. of Serum by slow intratibial drip and glucose fluids orally.

29. 9.49. Diarrhoea still present. Given Sulphasuccinate Gm. ½ four hourly for five days, at the end of which time the stools appeared to be normal.

30. 9.49. Feeding by gastric drip commenced with milk plus one raw egg per pint. This was continued for a week, at the end of which time the child's skin had improved somewhat and the oedema was less marked. The hair condition was rather worse, however.

7.10.49. Oral feeding recommenced. The child was very apathetic and listless, but could be persuaded to take milk. One raw egg was still being mixed with every pint of milk.

Urine examination shewed albumen one plus, and microscopical examination of a centrifuged specimen shewed a very occasional red cell but no casts. Gram film of deposit - N.A.D. Weight: 14 lbs. 8 ozs. 2 ccs. of crude liver extract were given intramuscularly and continued twice weekly.

10.10.49. Only very slight oedema of feet. Skin much improved. Still very listless. Tended to vomit with every feed.

11.10.49. Owing to vomiting it was decided to substitute meat for milk and the child readily took eggs, liver, tripe and minced meat without vomiting.

14.10.49. Oedema practically gone. Child obviously improving although very slowly. Weight: 14 lbs. 12 ozs.

This improvement was maintained until 20.10.49 when he again started diarrhoea and vomiting and there was a return of oedema.

After 24 hours on fluids only there was no further vomiting but the child had obviously suffered a severe setback. He no longer wanted to eat, was very irritable and shewed more oedema.

24.10.49. Gastric drip recommenced, but oedema increased, the skin condition deteriorated there being several areas of depigmentation present and some exfoliation at the tops of both thighs and in spite of all efforts the child steadily deteriorated and died on 29.10.49.

(Note: The mother was most co-operative throughout and helped us all she could.)

Post Mortem - 8 hours after death.

Terminal congestion of the lungs, a normal heart, an enlarged and fatty liver, very thin translucent gut walls, and an absence of mesenteric and omental fat. No abnormalities of kidney, suprarenal, spleen or brain were found.

Micros:-

Considerable fatty changes in liver cells especially at periphery of liver lobules but seen in practically all liver cells. In many areas adjacent to the portal tracts the liver cells appeared to have been so distended with fat that they had actually burst. There was a slight round celled infiltration in the portal tracts. No increase of fibrous tissue was found.

Kidney. Apart from very marked degenerative changes in the epithelium of the proximal tubules, no abnormality was found.

Spleen. Congestion of pulp. Malpighian corpuscles shewed hyaline changes of the central arterioles.

Suprarenal. No obvious abnormality found.

CASE No. 40.

JACK. (4035) Male. Age: 1½ - 2 yrs. Tribe: Lamba.

History.

No past history available before 31. 8.49 when he began to attend one of our Clinics with diarrhoea. This continued intermittently till 7. 9.49 when he was given five days' treatment with Sulphamerazine Gm. ½ eight hourly. This stopped the diarrhoea but the child was rather thin and the mother was asked to bring him daily to the Clinic for extra food.

Family History:-

Nil of note.

Diet:-

Breast milk and mealie meal porridge.

Present Condition - 22. 9.49.

An obviously undernourished child weighing 15 lbs. 12 ozs; with oedema of the feet and ankles, thin pale hair which was falling out at the back and sides, and hyperpigmentation (of the "crazy pavement" variety) of the skin of the dorsum of the feet and the outer borders of both legs. The liver was palpable one finger's breadth below the right costal margin and moist crepitations were heard at both lung bases. No abnormality of the heart was found, and the spleen was not palpable. There was no glossitis or angular stomatitis or anaemia. Malaria parasites were not found. It was noted that the soles of both feet were abnormally pink but at no time was there either an abnormal amount of perspiration or photophobia.

Treatment and Progress.

Treatment was commenced with milk only, 1½ pints a day being given.

26. 9.49. Rather worse. Appetite very poor. Refusing food. Riboflavine 10 mgms. given by intramuscular injection and repeated next day without any improvement in appetite.

29. 9.49. Severe diarrhoea which responded to Sulphonamides.

1.10.49. The child obviously disliked our milk, but we found that he liked meat and so we allowed him to eat as much of this as he wanted.

3.10.49. Appetite considerably improved but still refusing to take milk. Oedema still present but skin looking more normal. Hair very scanty, pale and of fine texture.

6.10.49. Oedema decreasing. Now eating meat well, but still refusing milk. Weight: 17 lbs. 8 ozs.

8.10.49. Very slight oedema present. Liver still palpable one finger's breadth below the right costal margin. Chest and heart - N.A.D. Skin practically normal. Hair very thin and pale but new growth appearing.

10.10.49. Oedema practically gone. Discharged at mother's request.

Follow-up.

The mother attended the Clinic regularly and extra feeding with meat was continued.

20.10.49. Weight: 18 lbs. 14 ozs. No oedema detected. Hair growing well. Liver still palpable but diminishing in size.

20.11.49. Weight: 19 lbs. 12 ozs. Hair and skin both normal. Liver still palpable a little less than one finger's breadth below the right costal margin. No oedema detected. Chest and heart - N.A.D.

CASE No. 41.

MWAPE. (5405) Male. Age: 21 mths. Tribe: Bisa.

History.

The child was first seen on 12.10.49 and was then shewing the typical signs of advanced Kwashiorkor. No previous history could be obtained beyond the fact that for several days the child had been suffering from severe diarrhoea and that he was born and had always lived at Luanshya.

Family History:-

Mother quite normal and 7½ months pregnant. One other child - older - appeared to be quite healthy. The husband was an underground Boss Boy.

Diet:-

The child was being weaned but only receiving mealie meal porridge in addition to breast milk.

Present Condition - 12.10.49.

An obviously sick emaciated child with oedema of the feet and ankles and scrotum; exfoliation of the skin of the perineum and groins; hyperpigmentation in patches ("crazy pavement" areas) on the buttocks, tops of thighs and lateral aspects of both legs. The hair was very scanty, pale, thin and practically straight. There was no cheilosis but marked angular stomatitis, glossitis and gingivitis. The liver was palpable rather more than one finger's breadth below the right costal margin, the spleen not palpable and no cardiac abnormality was found. Moist crepitations were heard all over the chest. The boy weighed 15 lbs. 4 ozs. and had severe diarrhoea. Blood examination did not shew any malarial parasites. There was no obvious anaemia.

Treatment and Progress.

Sulphamerazine Gm. ½ eight hourly was given for five days to control the bronchitis and gastro-enteritis. Food was withheld for 24 hours and glucose fluids only given. Thereafter, we attempted to feed the child with milk and meat.

13.10.49. Anorexia and lethargy marked. Exfoliation of skin of outer aspect of legs commencing. Injection of Vitamin B. Complex given by intramuscular route.

14.10.49. Injection Vitamin B. Complex repeated.

15.10.49. Anorexia and lethargy very much worse. Retained one pint of milk which contained a raw egg - given by gastric drip. No diarrhoea.

16.10.49. Injection Vitamin B. Complex repeated. No improvement. Gastric drip continued.

17.10.49. Injection Vitamin B. Complex repeated. Exfoliation and skin changes more marked. Oedema about the same as when originally seen. Weight: 16 lbs. 12 ozs.

18.10.49. Injection Vitamin B. Complex repeated. Received and retained two raw eggs, one pint of milk and half a pint of glucose saline by gastric drip. Skin lesions appeared to be healing and it was thought that the child shewed signs of improvement.

19.10.49. Rapid collapse and death.

Post Mortem - 2 hours after death.

Slight congestion of the lungs, an enlarged and fatty liver and a complete absence of mesenteric and omental fat. The bowel wall was translucent and very thin. No other abnormalities found.

Micros:-

Liver. Gross fatty changes involving every cell in the section. The portal tracts were ill-defined and contained a few round cells.

Kidney. Marked degenerative changes of the epithelium of the proximal tubules.

Pancreas and Suprarenal. N.A.D.

CASE No. 42.

UNITY. (5237) Female. Age: 10 mths. Tribe: ?

History.

Three months before being seen at one of our Clinics the child had Measles. The mother stated that her child had been ill on and off ever since. She brought her to the Clinic because of conjunctivitis.

Family History:-

Nil of note.

Diet:-

Breast milk and a very little mealie meal porridge.

Present Condition - 12.10.49.

Examination shewed an obviously undernourished child with early "crazy pavement" skin changes on the dorsum of the feet and the outer aspects of the lower part of the legs. The hair was pale, thin and scanty. No oedema was present. Moist crepitations were heard at both bases, the liver was palpable rather more than one finger's breadth below the right costal margin, the spleen not palpable and no cardiac abnormality was found. There was purulent conjunctivitis of both eyes but no cheilosis, glossitis or angular stomatitis. Weight: 13 lbs. Blood examination: no malarial parasites seen.

Treatment and Progress.

(a) Sulphamerazine Gm. ½ eight hourly for five days.
(b) 10% Solution of Sulphacetamide as eye drops instilled frequently after irrigating the eyes with Boracic Solution.
(c) One pint of milk daily plus a helping of minced meat and vegetable stew.
(d) Tablets of Vitamin B. Complex one t.i.d. for ten days.

The whole of the treatment was carried out at the Clinic, the mother bringing the child regularly.

17.10.49. Eyes better. Weight: 13 lbs. 8 ozs. General condition unchanged.

24.10.49. Weight: 13 lbs. 8 ozs. Child rather pale but no anaemia present. No oedema found.

7.11.49. Weight: 13 lbs. 12 ozs. Skin changes less obvious but still rather pale. Chest: N.A.D. Liver still palpable one finger's breadth below the right costal margin. Child more alert but still looks undernourished.

14.11.49. Diarrhoea for last three days which responded to simple treatment. Weight: 13 lbs.

21.11.49. Weight: 13 lbs. 8 ozs. Skin changes scarcely detectable. Hair growing thicker and darker. Liver still palpable one finger's breadth below the right costal margin.

28.11.49. Weight: 13 lbs. 13 ozs.

CASE No. 43.

ELINA. (11009) Female. Age: 1¼ yrs. Tribe: Bemba.

History.

The child was brought to one of our Clinics on 18.10.49 with a history of having had diarrhoea and vomiting for three or four days. The mother stated that the child was always healthy and that she was feeding her with breast milk and mealie meal porridge.

Family History:-

Mother healthy and not pregnant. Two older children seen and both appeared to be normal.

Present Condition - 18.10.49.

An emaciated and slightly dehydrated child with early "crazy pavement" skin changes on the dorsum of the feet and the outer aspects of the lower limbs. The hair was paler than normal and tended to be straight. Moist crepitations were heard all over the chest, the liver was palpable two fingers' breadth below the right costal margin, the spleen not palpable and no cardiac abnormalities were found. There was no obvious anaemia and no cheilosis, glossitis or angular stomatitis. Oedema was not detected neither were malarial parasites demonstrated in a thick blood film. Weight: 11 lbs. 12 ozs.

Treatment and Progress.

Treatment - which was carried out at the Clinic - consisted of Sulphamerazine Gm. ½ eight hourly for five days, and extra nourishment in the form of milk - one pint daily - and minced meat and vegetable stew. Two tablets of Vitamin B. Complex were given daily for ten days.

20.10.49. Slight oedema found at ankles but general condition beginning to improve, i.e., the diarrhoea had ceased and the child's chest was much more dry.

25.10.49. Weight: 13 lbs. 2 ozs.

31.10.49. Weight: 13 lbs. 9 ozs. No oedema detected. Skin looking practically normal. Appetite improved. Hair unchanged.

7.11.49. Slight return of diarrhoea which was easily checked. Weight: 13 lbs. 6 ozs.

14.11.49. Greatly improved. Weight: 14 lbs. 2 ozs. Liver now palpable one finger's breadth below the right costal margin.

28.11.49. Weight: 14 lbs. 9 ozs. Hair looking more normal. No skin changes found. Liver still palpable one finger's breadth below the right costal margin. Child brighter.

CASE No. 44.

ELISA. (7013) Female. Age: 11 mths. Tribe: Bisa.

History.

The patient was first seen on 20.10.49 when her mother brought her to one of our Clinics because of a cough and conjunctivitis. The child was said to have been ill for one week. No history of previous illness could be obtained.

Both the mother and one older child were healthy and the mother was feeding the patient with breast milk and mealie meal porridge.

Present Condition - 20.10.49.

Examination shewed that the child had Measles. The temperature was 101.2°F. There was slight conjunctivitis of both eyes; oedema of the feet and ankles; marked "crazy pavement" hyperpigmentation of the outer aspects of both lower limbs; 'gingery' thin hair and slight angular stomatitis. The liver was palpable two fingers' breadth below the right costal margin and the spleen not palpable. Moist crepitations were heard at both lung bases and there was consolidation of the mid-lobe of the right lung. No cardiac abnormality was detected. Malarial parasites were not found. Weight: 13 lbs. 14 ozs.

Treatment and Progress.

Hospitalisation being declined, the necessity for regular and prolonged attendance at the Clinic was impressed upon the mother. She did not, however, co-operate once the acute phase of the illness was over. Treatment was commenced with Sulphamerazine Gm. ½ eight hourly for five days and 10% Sulphacetamide Solution for the eyes. Extra nourishment in the form of one pint of milk and a little minced meat was given daily.

25.10.49. Weight: 14 lbs. Lungs still very moist but consolidation not found clinically. Eyes quite better. General condition not improved.

7.11.49. Attendance irregular. Weight: 14 lbs. 2 ozs.

13.11.49. Still not attending daily. Weight: 13 lbs. 12 ozs. Oedema of feet still present and liver palpable as before. Skin condition unchanged.

14.11.49. Oedema diminishing and skin shewing signs of improvement. Weight: 14 lbs. 4 ozs. Lungs still moist at bases.

Further treatment was prevented by the mother taking her child home to her village.

G E N E R A L C O M M E N T S

GENERAL COMMENTS.

The 44 cases of Malignant Malnutrition recorded here were collected over a period of two years in the course of work amongst the Africans of Luanshya, as a Medical Officer of the Roan Antelope Copper Mines, Limited.

The African Township of the Company has a population of between 30 and 35 thousands and although the majority of these people are from various parts of Northern Rhodesia, many have come from Nyasaland, the Belgian Congo, Tanganyika and Portugese East Africa.

Medical facilities are provided in the form of a well equipped 200 bed hospital and three large Clinics, the latter being for Child Welfare and Maternity work.

Any sick woman or child is expected to attend the nearest Clinic, transfer from there to the Hospital being arranged if necessary, and although the African women we meet are primitive and backward, full of superstitions and extremely suspicious of European Medicine, yet attendance at these Clinics is substantially and slowly increasing, now averaging over 22,000 attendances per month. It is not unusual however for ignorance and fear to result in such long delay before our help is sought that patients are sometimes first seen when moribund, or else not until after death.

This unfortunate tendency is illustrated in Case Records numbered 8, 9, (when readmitted), 10, 14, 15, 24 and 36, where we were confronted with obviously moribund children; Cases numbers 7 and 29, where the condition had progressed to far that it is doubtful if any treatment could have been effective, and in Case No. 12, where the child was not seen before death.

We find that considerable persuasion is usually necessary before a mother will agree to let us treat her child in Hospital, and then - until recently - only on condition that she and any other children she may have under the age of four years were allowed to stay in the Ward with the patient. Under these conditions, hospital treatment frequently became farcical. Mothers would suckle their babes whenever they felt so inclined, children would be found outside the Ward being washed in cold running water soon after sunrise, attempts at gastric drip feeding would have to be abandoned after the tube had been removed by the mother and reinserted by the Sister several times in the course of a few hours, or food meant solely for the patient would be given to less needy brothers and sisters.

Fortunately, we have been able gradually to introduce reforms until we are now probably unique, as far as Northern Rhodesia is concerned, in being able to exclude parents and relatives from the Ward except during visiting hours or when their presence is required by the Ward Sister.

C A S E A N A L Y S I S

CASE ANALYSIS.

1. The Incidence of Malignant Malnutrition.

(a) Percentage.

Exact figures of the infant population of our African Township are, unfortunately not obtainable, but it is estimated that it contains 5,000 children between the ages of 6 to 30 months, and as the total number of cases of Malignant Malnutrition found during two years was only 44, it can be seen that the incidence of this disease at Luanshya is low, one child in a hundred developing the condition in a recognizable form. Had our knowledge of the early manifestations of the disease been greater at the outset, however, it is possible that a slightly higher figure would have been obtained.

(b) Sex.

No appreciable difference was found in the numbers of each sex involved, there being 24 males and 20 females in this series .

(c) Age.

The age incidence found was as follows:-

Below 1 year of age	...	7 cases.
1 to 1½ years of age	...	21 cases.
1½ to 2 years of age	...	12 cases.
Over 2 years of age	...	4 cases.

Trowell[9] recorded 144 adult cases seen in one year. So far we have been unable to recognize the disease except in children.

(d) Season.

16 cases occurred in the first quarter of the year, 9 in the second, 8 in the third and 11 in the fourth.

The six months October to March inclusive correspond roughly to our rainy season. Temperatures are high and so is humidity. This six month period saw the greatest incidence of Malignant Malnutrition - 27 cases. During the middle six months of the year, temperatures fall slowly to July and then rise again. The harvest is gathered in April and early May and a period of plenty begins, extending to October and November. From then on, in village life, less and less food becomes available until the next harvest. It is doubtful, however, if this period of want exists in the artificial

conditions of a township.

The significance of the age and seasonal incidence is discussed further in the section dealing with aetiology.

2. Mortality.

There were 32 deaths in the series and 12 recoveries - a mortality of 73%.

Of the 32 deaths, 9 occurred in patients whose condition was probably hopeless from the time we first saw them, and one was in a child not seen until after death. Many of the remaining 22 fatalities could probably have been prevented had adequate treatment been possible.

The mortality according to age and sex was as follows:-

Below 1 year of age.	7 cases.	Deaths 4 or 57%
1 to 1½ years of age.	21 cases.	Deaths 16 or 76%
1½ to 2 years of age.	12 cases.	Deaths 9 or 75%
Over 2 years of age.	4 cases.	Deaths 3 or 75%
Males.	24 cases.	Deaths 18 or 75%
Females.	20 cases.	Deaths 14 or 70%

It is significant that of the first 31 cases encountered only 2 recovered.

(3) Symptomology.

The signs and symptoms present at the time when the diagnosis of Malignant Malnutrition was made, and the number of times each was encountered are recorded below.

Hair changes.		29
Skin changes:	Pallor...	2
	"Crazy Pavement" areas	26
	Depigmentation.	17
	Exfoliation	9
Glossitis.		2
Stomatitis.		1
Angular Stomatitis.		8
Cheilosis.		1
Oedema:	of the feet and ankles.	35
	of the perineal region.	6
	elsewhere.	2
Enteritis.		24
Irritability.		5
Lethargy.		8
Anorexia.		2
Enlargement of the liver.		43

In my experience the earliest sign of the approach of clinical Malignant Malnutrition was enlargement of the liver. When this was found in conjunction with either oedema of the feet, skin or hair changes of however slight a degree, a diagnosis of Malignant Malnutrition could confidently be made.

4. Pathology.

26 Post Mortem examinations were performed.

In every case the outstanding pathological feature was the fatty changes found in the liver. This organ was always enlarged and frequently yellow-orange in colour. Microscopically, as can be seen from the photomicrographs, it was not unusual to find practically no liver tissue at all but simply a honeycomb of fat globules. In no case was an excess of fibrous tissue found. Where the fatty changes were less intense, they were always most pronounced at the periphery of the liver lobules.

Beyond the presence of a bronchitis, bronchiolitis or broncho-pneumonia and the signs of enteritis, little of interest was found in the other organs of the body. No increase of fibrous tissue was found in the pancreas and atrophy of the suprarenals was not seen.

Degenerative changes were found in heart muscle fibres and also in the epithelium of the renal tubules.

What appeared to be a normal amount of subcutaneous fat was frequently present, but almost invariably there was a complete absence of mesenteric or omental fat and also the small intestine walls appeared to be unusually thin and translucent.

Oedema of the brain was found whenever oedema was demonstrable elsewhere.

D I S C U S S I O N

D I S C U S S I O N

The Aetiology of Malignant Malnutrition.

When Trowell first named this condition "the syndrome of malignant malnutrition"[5], he came to the conclusion that it was due to "a deficiency of calories, of proteins and of the Vitamin B. complex". Altmann[7] decided that the cause was "the lack of food in general, and the lack of protein and essential Amino-acids in particular". Gelfand[10] suggested the possibility of a toxic factor which might be present in mealie meal but the majority of those dealing with this condition seem to be of the opinion that the essential cause is a deficiency of protein in the diet and an excess of carbohydrate.[11]

In the cases under review, the histories although scanty shew quite clearly that the children's diets were markedly deficient in protein and contained a considerable quantity of carbohydrate.

To understand the cause of this dietetic imbalance as we see it at Luanshya, some knowledge of African customs is necessary. In normal village life an African baby is breast fed until either another infant arrives or until the child is about three years of age. At the same time, however, the infant from a very early age, sometimes even at one month, receives small quantities of the prevailing cereal staple, which varies from place to place in Northern Rhodesia, the main ones being finger millet, maize and cassava.

Normally the cereal is prepared in the form of a thick porridge but for infants it is mixed with sufficient water to give it about the consistency of cream. To this, after about the age of nine months - sometimes earlier and sometimes later - is added small quantities of green vegetables indigenous to the district, sweet potato, beans, groundnuts and peas. These are given in increasing quantities with larger and firmer amounts of the cereal staple until the child is fully weaned.

It is seldom that first class protein appears in the diet, but occasionally the child may be given a little meat or fish, and the meat may be anything from a portion of a mouse to a piece of an elephant.

At no time would the diet be considered adequate by our standards but I think it is significant that in six years during which I worked as a medical missionary in Northern Rhodesia and Northern Nyasaland, although my work necessitated extensive travelling and the visiting of many hospitals, clinics and dispensaries, I cannot recollect seeing a single case of malignant malnutrition.

Furthermore, although I have described this syndrome and shewn typical photographs to many mission nurses working in purely rural areas, I have met none who could remember seeing anything resembling it. Examples of marasmic infants, and emaciated and semistarved children are by no means rare in these areas, but their condition was regarded as being due to a deficiency of food in general, and it usually responded rapidly to treatment provided that no other pathological condition, such as tuberculosis for example, was present.

In Luanshya however an entirely different form of life exists.

The males work and receive wages for their labour plus adequate rations on a scale seldom achieved in village life. In addition, some food is provided for their families but, as can be seen from the ration scale reproduced below, this food is deficient in protein.

With such a large population settled in one small area, it is obviously impossible for every woman to cultivate her own garden, as she does in her village, and so supplement her rations with the beans, peas, groundnuts etc. to which she is accustomed. Even were it possible, most of the women realising that their stay in Luanshya is probably of short duration - almost 50% of our labour is replaced annually, - would not feel that the attempt was worth while. Also, since there are about 6,000 wives in our African township there is very little chance of them obtaining any quantity of the wild herbs, groundnuts and edible fruits to be found in the surrounding bush.

As a direct result therefore of this departure from village life, unless the husband is willing to spend part of his wages on food for his family, there is bound to be a deficiency of protein in the diet of his children and although the African is only too ready to spend his wages on beer, clothing, ornaments, bicycles and wrist watches, or even to accumulate a fair sum in his savings account, he is unfortunately seldom willing to spend any of it in buying food to supplement his children's rations. Later on - after he has lived here for a year or so - he may come to appreciate the necessity for doing this, but certainly at first the whole idea is completely foreign to him.

Our normal ration scale for married employees is given below:-

AFRICAN LABOUR - RATIONS PER WEEK.

Bread (with raisins)	2 lbs. 10 ozs.
Maize Meal	10 lbs. 8 ozs.
Meat. (Red meat with not more than 25% bone but including 7 ozs. of sausage.)	3 lbs. 12 ozs.
Groundnuts either shelled or unshelled.	8 ozs. 12 ozs.
Beans and/or Peas.	15 ozs.
Sugar (additional to sugar used for sweetening cocoa.)	7½ ozs.
Honey - or (when not obtainable) Jam	4 ozs.
Salt.	3½ ozs.
Vegetables & Fruit. (should include 5% Fruit) - maximum	2 lbs. 10 ozs.
Vegetable Oil - or (when not obtainable) Dripping.	7 ozs.
Tea (dry leaf)	½ oz.

WOMEN.

5 lbs. Mealies or Cassava.

5 lbs. Cassava Meal.

8 ozs. Beans.

3½ oz. Salt.

1 lb. Meat.

CHILDREN.

5 lbs. Mealie Meal or Cassava.

Some additional issues are made for underground employees, night shift men and those working overtime, but the above represents the food normally available per week, and these rations are collected weekly.

Meals are usually prepared twice a day and each meal consists of a quantity of thick porridge made from the cereal, and a "relish" which is made either from meat - if obtainable - or from beans, peas, groundnuts or wild herbs and fruits. Having prepared the meal, the wife serves her husband first and he eats as much as he wants. She then has the rest for herself and any fully weaned children she may have. Although she would not knowingly hold back essential food stuffs from her children, yet meat would certainly be considered too valuable to give to the young ones, and the whole of the meat ration would be consumed by the man, his wife, and their older children, either on the day it was obtained, or - at the very latest - by the next evening. After this the "relish" would have to consist of the beans, groundnuts etc., available, or else more meat would have to be bought.

In spite of many enquiries, I was only able to find a few African families where any child under the age of three received any beans or groundnuts. The parents invariably agreed with me that it was their custom to give them these foodstuffs in their villages, but stated that at Luanshya their rations contained far too little of these foods for them to be able to afford to give any to the very young children.

The position is further complicated by the fact that the African is an hospitable creature and it is only too often that those at Luanshya have to feed visitors, relations and hangers-on who have come to stay with them.

These are then the prevailing factors which explain why it is that so many (at least 90%) Luanshya children up to the age of about 2½ or 3 years receive a diet which consists almost entirely of breast milk and mealie meal porridge; a diet which is totally inadequate in its content of protein whileit contains a considerable quantity of carbohydrate.

The obvious question then arises, if this is so, and if malignant malnutrition is brought about by such conditions, why is it that only forty-four cases were found in two years amongst such a large African population? Have we been failing to recognise the condition, or does it exist in a sub-clinical form?

One of the most constant findings in this syndrome is the presence of fatty changes in the liver. Since we considered it inadviseable to perform liver biopsies on our young patients, we decided to examine the livers of all children who died between the ages of 1 and 3 and in whom Kwashiokor had not been diagnosed during life. Thirty consecutive post mortem dissections were performed during November and December 1948, and in none did the liver shew fatty changes to the naked eye. Microscopically, moderate fatty changes were found in only one case.

Photomicrographs and details of age and the cause of death are given from eight of these cases:-

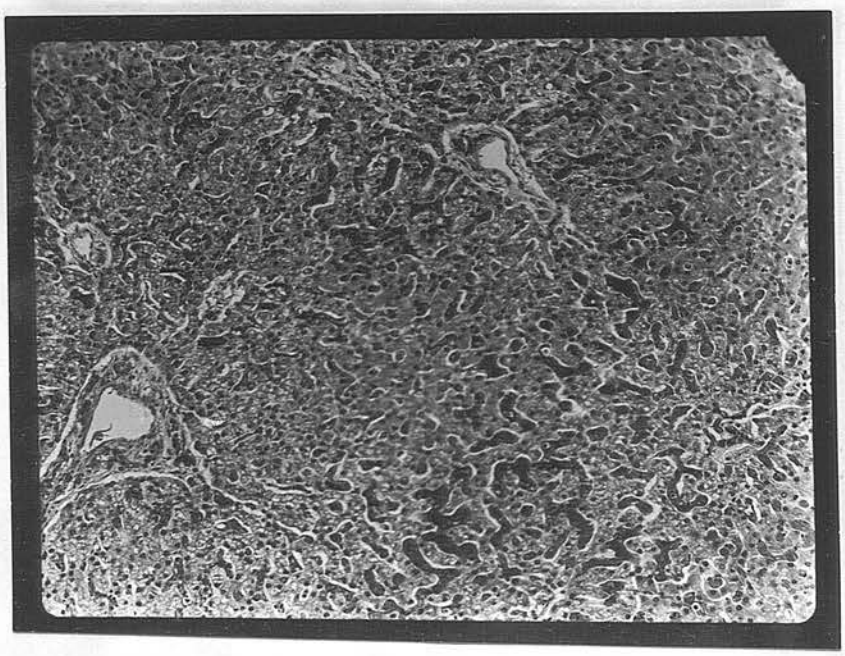
CASE No. 1 (c).

PETER. (2384) Male. Age: 18 mths. Tribe: Bulima.

Seen when moribund and found to have measles and acute gastro-enteritis. The child was emaciated and dehydrated.

Post Mortem. 10.11.48. 22 hours after death shewed broncho-pneumonia and acute gastro-enteritis. The liver was congested.

Liver. (x 150 approx.)



CASE No. 2 (c).

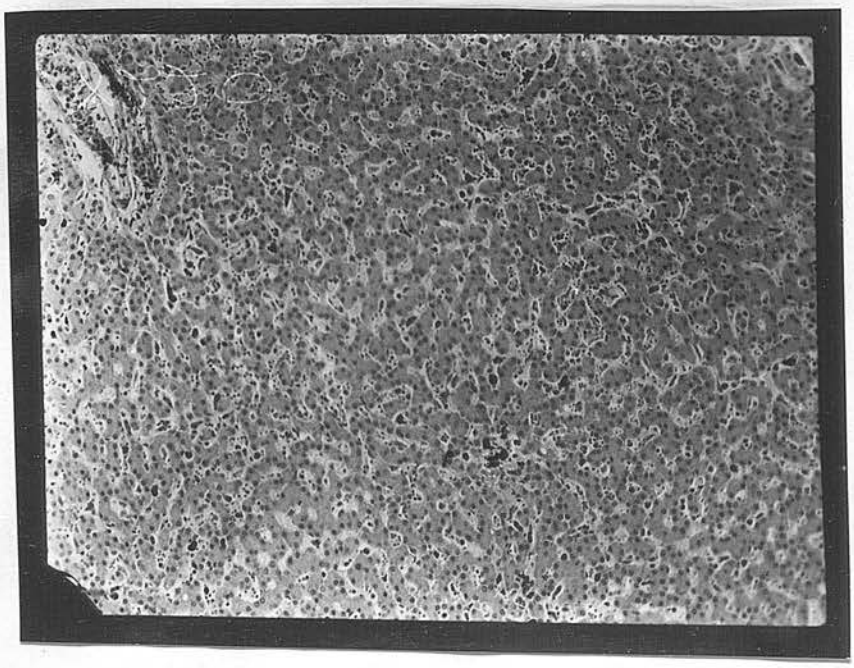
KABIYA. (8220) Male. Age: 2 yrs.

Not seen before death.

Post Mortem. 14.11.48. 8 hours after death - shewed Measles and lobar-pneumonia.

There was congestion of the liver.

Liver. (x 150 approx.)



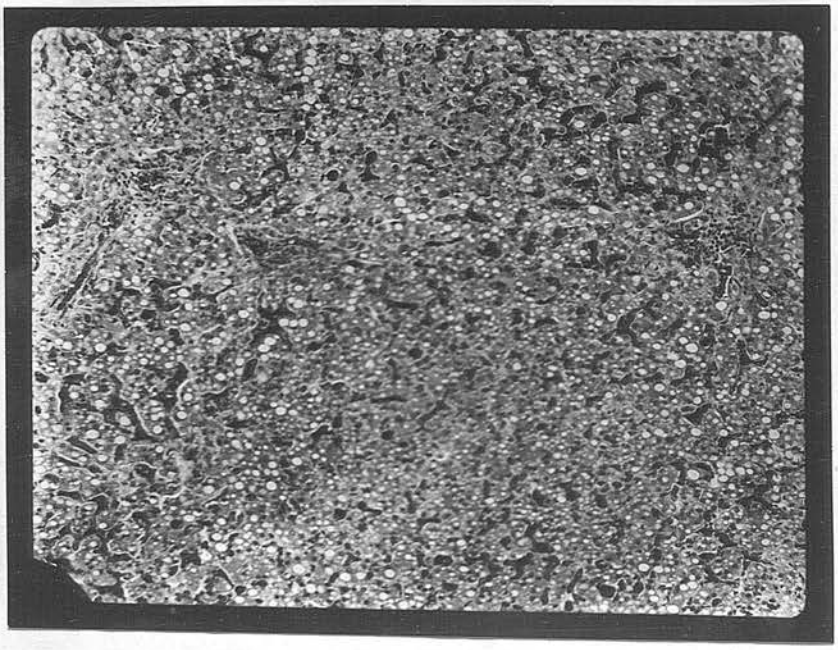
CASE No. 3 (c).

MUSONDA. (3257) Male. Age: 1 yr. Tribe: Bemba.

Brought to hospital after death. 15.11.48.

Post Mortem. 1 hour after death shewed
Menigococcal Meningitis.

Liver. (x 150 approx.)



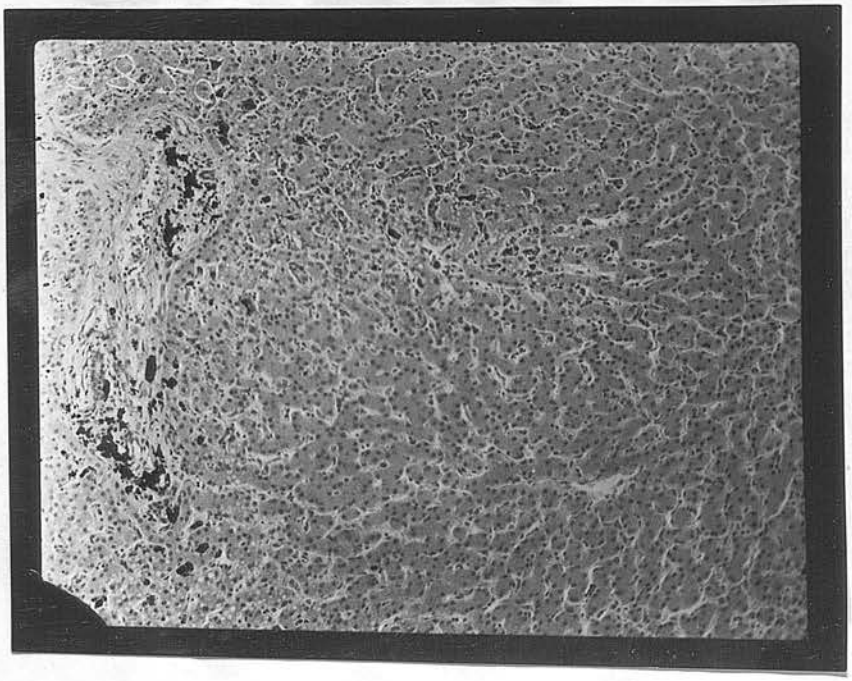
CASE No. 4 (c).

JOHN. (3289) Male. Age: 15 mths. Tribe: Bisa.

Brought to hospital after death.

Post Mortem. 16.11.48. 8 hours after death, shewed extensive lobar pneumonia.

Liver. (x 150 approx.)



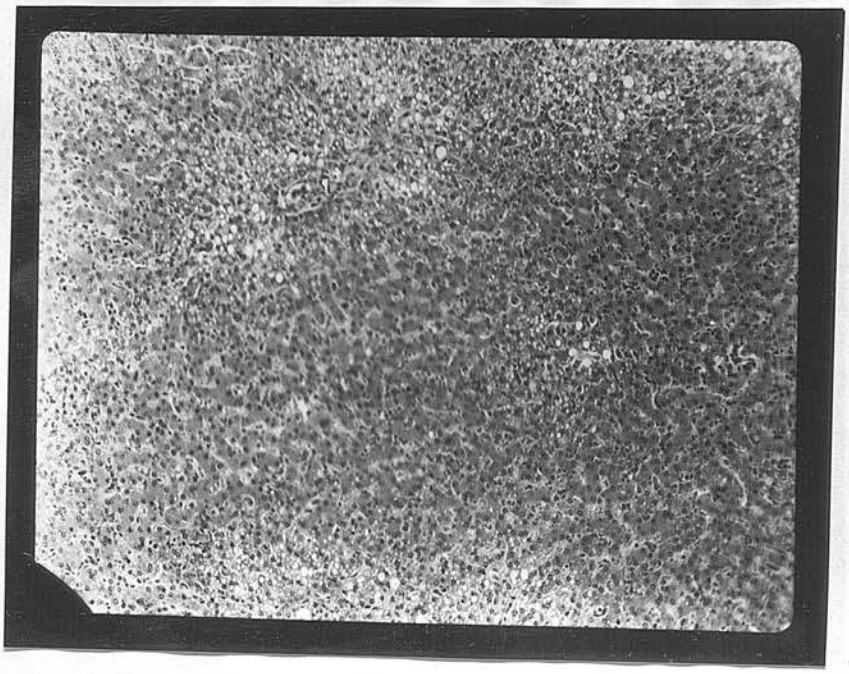
CASE No. 5 (c).

JENI (9453) Female. Age: 9 mths. Tribe: Lunda.

16.11.48. Acute gastro-enteritis, emaciation and dehydration. Moribund when first seen.

Post Mortem. 6 hours after death shewed broncho-pneumonia and acute gastro-enteritis.

Liver. (x 150 approx.)



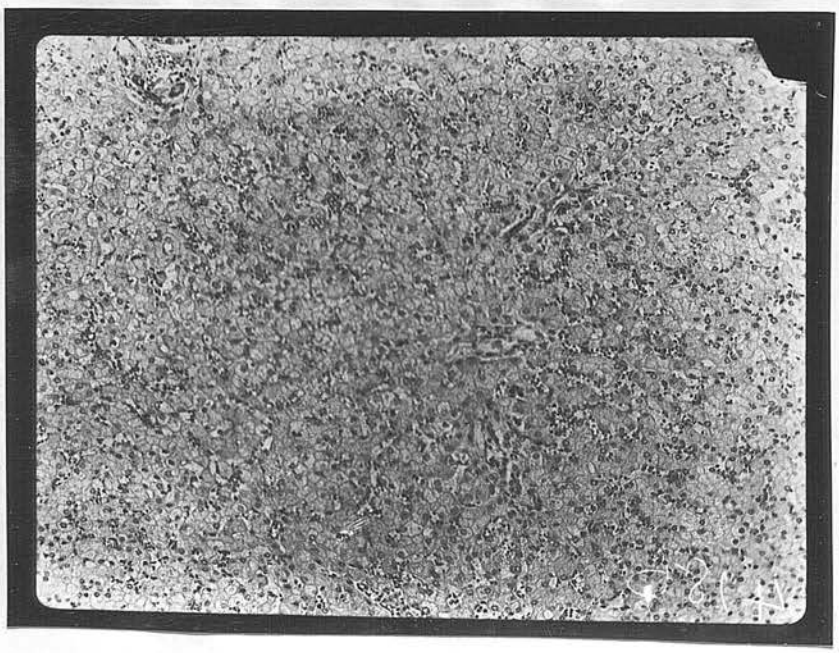
CASE No. 6 (c)

BLACKWELL MUDALA. Male. Age: 15 mths. Tribe: Bemba.

Seen when moribund. History of diarrhoea and vomiting for seven days. Very emaciated and dehydrated.

Post Mortem, 16.11.48, Four hours after death shewed broncho-pneumonia and acute gastro-enteritis.

Liver. (x 150 approx.)



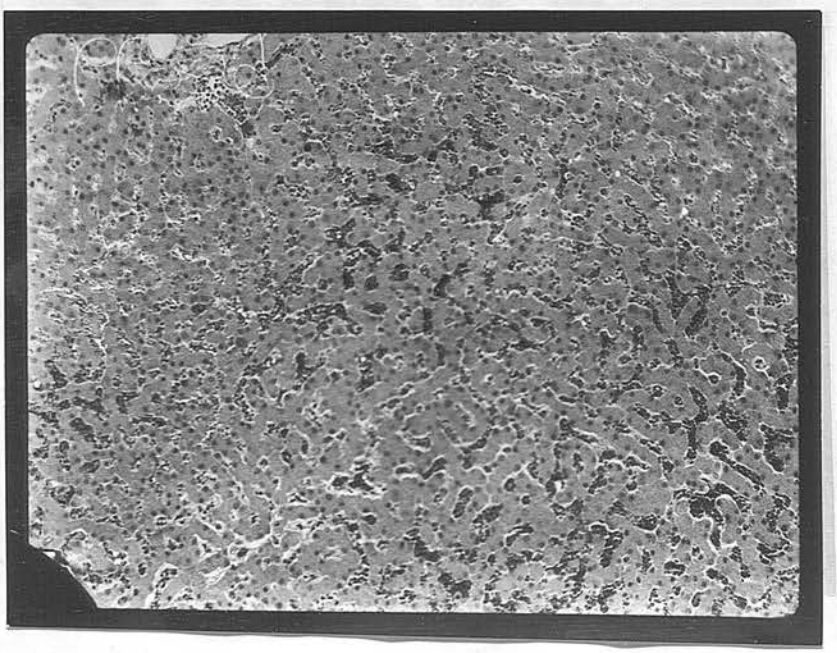
CASE No. 7 (c).

NGOSA. (6659) Male. Age: 3 yrs. Tribe: Bemba.

19.11.48. Brought to hospital after death.
History of diarrhoea and vomiting for three days.

Post Mortem 5 hours after death shewed acute gastro-enteritis and broncho-pneumonia.

Liver. (x 150 approx.)



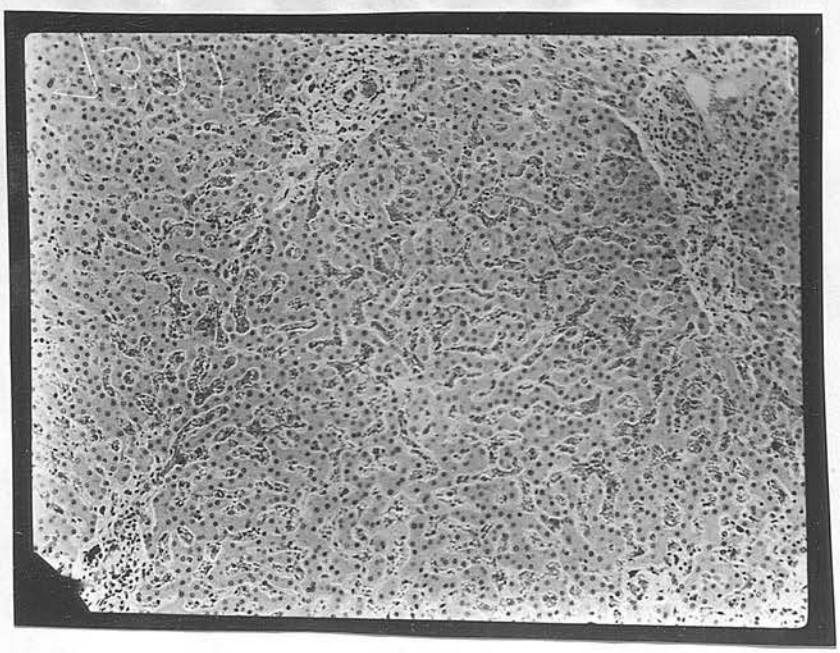
CASE No. 8 (c).

MUBANGA. (7391) Female. Age: 2½ yrs.

30.11.48. Brought to hospital after death with a history of diarrhoea and vomiting for 24 hours.

Post Mortem, 9 hours after death, shewed extensive lobar pneumonia and congestion of the alimentary tract.

Liver. (x 150 approx.)



Moderate fatty changes are seen in the liver of case No. 3 (c) and slight changes in that of case No. 6 (c) and these two sections were the only ones of the thirty examined which shewed fatty changes. It is thus difficult to escape the conclusion that although the low protein high carbohydrate diet which our African children receive may play a part in the aetiology of malignant malnutrition, such a diet does not necessarily cause the syndrome to develop.

A review of the histories of my 44 cases shews quite clearly that the onset of recognisable malignant malnutrition was in every case, except No. 8, preceded by some debilitating condition, the commonest being gastro-enteritis. Furthermore, if while under treatment a child appeared to be recovering, the onset of any further acute infective condition invariably led to an immediate severe relapse.

Case No. 18 is a good example of malignant malnutrition developing while the child was receiving treatment for repeated attacks of diarrhoea. Similarly, in Case No. 19, the syndrome became evident while the patient was in hospital and being treated for enteritis. The same trend is obvious in Case No. 31, while cases No. 27 and 38 illustrate very well the effect of severe debilitating illness on these undernourished children. In case No. 27 within a period of two months, the child had had measles, bronchitis, and three attacks of gastro-enteritis, while in Case No. 38, primary atypical pneumonia appeared to precipitate Kwashiorkor. In case No. 39, two attacks of diarrhoea preceded the onset of recognisable Kwashiorkor and a further attack, which came when the child was improving, resulted in a severe relapse and death.

It would appear therefore that as far as we at Luanshya are concerned, malignant malnutrition is the direct result of debilitating illness on undernourished children.

It must be remembered, however, that (a) It is possible that frequent debilitating illnesses are the direct result of the low protein high carbohydrate diet our young African children receive, - either because of the lack of protein itself, or because of the absence of protective materials present in the protein containing foods, or from a combination of both these factors! (b) In the presence of acute illnesses the body requires an increase of protein for normal metabolism, and in the absence of an increased protein intake, consumes some of its own proteins. In the case of our African children, not only is the increased protein demanded not available in the

diet, but frequently the small amount of protein present in the food of the child is further depleted as a result of gastro-enteritis, and this is probably why acute infective conditions, especially gastro-enteritis, appear to precipitate the onset of malignant malnutrition.

2. The Treatment of Malignant Malnutrition.

A study of the available literature leaves one with the impression that the treatment of malignant malnutrition is now well established and cure relatively certain. One has only to eliminate outstanding infections and at the same time give protein in an easily assimilable form (chiefly milk) and all will be well. For example, using a lactic acid skimmed milk formula Altmann achieved a recovery rate of 80%.[7]

My experience, however, was so much at variance with that of Trowell and Altmann that it was almost as if I were dealing with a different disease.

In spite of feeding with milk and attempting to eradicate existing infections, patient after patient died with discouraging regularity, and to this was added the mortification of watching others develop the syndrome while actually receiving the milk that was supposed to cure it. For example, in Case No. 26, the patient, a male child aged 1½ to 2 yrs., was receiving treatment for enteritis and subtertian malaria. We supplemented his breast feeds with 1½ pints of milk a day and after ten days of this he started to shew the unmistakeable signs of malignant malnutrition accompanied by progressive anorexia. He died.

In studying my cases, it seems that our treatment may have been so often unsuccessful for the following reasons:-

(a) We may not have completely eradicated existing infections, or perhaps used the wrong drugs in attempting this.

(b) Not enough protein was present in the diet we gave, or the protein was not of the right kind.

(c) Vitamin preparations were frequently given.

(d) The condition was so far advanced that reversal was impossible.

I should like to discuss these points in some detail.

(a) The Eradication of Existing Infection.

The commonest infections which we encountered in our cases were gastro-enteritis, upper respiratory tract infections and malaria in that order of frequency. Helminthic bowel infestations were not met with and malaria is scarcely a problem at Luanshya.

With regard to malaria, however, it has been my experience that this condition is most quickly controlled in African children by giving Quinine by intramuscular injection and I have employed this method as a routine for a large number of years. Frequently one injection of from 3 to 5 grains is sufficient to control the acute symptoms, and thereafter, quinine, paludrine or mepacrine is given orally for a few days. No attempt is made to cure the malaria as this only too frequently leads to a failure of natural immunity and the subsequent death of the African on the first occasion that he or she returns to their natural village life.

Although quinine frequently has a severe depressing effect on young children, my method of treatment minimises this considerably, and I do not think that it in any way contributed to the death of the few patients in this series who had malaria as well as Kwashiorkor.

With regard to the other two conditions, Gastro-enteritis is one of the commonest and most troublesome complaints with which we have to deal. Repeated stool examinations are usually completely negative as far as revealing the presence of any pathogenic coliform bacillus is concerned, and clinical examination is often frequently as barren in giving a clue to its aetiology.

In about half the cases though, some signs of upper respiratory tract infection are also found and in a very small proportion of cases ear infections are present. Our Clinic figures, however, shew that the incidence of gastro-enteritis and upper respiratory tract infections, if plotted, give curves which are practically parallel. As a result, our routine treatment for gastro-enteritis has developed into withholding food for 12 - 24 hours, meanwhile giving plenty of glucose and saline, and the exhibition of one of the Sulphonamides. Trowell[8] makes the point that penicillin is preferable in bacterial infections because its use is unaccompanied by the nausea and vomiting so often associated with Sulphonamides. Penicillin however is - in my experience - useless in controlling gastro-enteritis and sulphonamides invaluable. In practice our use of Sulphamerazine Gm. $\frac{1}{2}$ eight hourly in Clinic practice and Sulphathiazole Gm. $\frac{1}{4}$ six or four hourly in Ward work almost always resulted in rapid control of diarrhoea and did not produce vomiting. Its use may, however, have been a factor in the production of the anorexia we so frequently met.

The fact that diarrhoea returned in some of our cases does not necessarily mean that we failed to control the original infection. It is a well known fact that feeding of any kind in cases of severe malnutrition frequently provokes severe and intractable diarrhoea.

That a gastro-enteritic condition contributed to the cause of death of some of my fatal cases cannot be gainsaid, but it is my opinion that this condition was not infective, but was due either to the effect of food on severe malnutrition or to some change in the bowel itself by lack of protein.

(b) Protein Requirements in Treatment.

The main protein containing food employed by us in our treatment of this syndrome was milk and our milk was reconstituted full cream condensed milk. If given in a concentrated form, this preparation provoked nausea and vomiting, it was therefore always prepared to normal milk strength. In addition, a large number of our patients received minced meat, served in the form of a mince and vegetable stew, and a few patients were given food yeast and cassein hydrolysate.

Did our patients receive a sufficient quantity of protein? Theoretically, if all that was provided for the child was actually consumed by the child, the quantity was ample to bring about improvement. In Case No. 9, for example, all the signs of malignant malnutrition were present with the exception of anorexia. The patient received a minimum of 1½ pints of milk, 5 Gms. of Casein hydrolysate and 4 Gms. of food yeast daily - in addition to whatever he managed to suck from his mother's breasts. His total protein supplement was thus not less than 20 Gms. per day, and that this amount was ample was proved by the fact that in fourteen days he gained 2½ lbs. in weight, his oedema completely disappeared and his skin lesions healed.

In some cases, however, we strongly suspected that the patient did not get the quantity of food we provided for him. This was to be expected under the conditions described in the last paragraph of page 85. At our three Clinics, we insist on those getting extra nourishment consuming this actually at the Clinic. In this way some sort of check is kept on the children's condition, and the amount of food they get. Even here, however, when there are about 150 other people clamouring for attention it is not possible always to make sure that it is the sick child who gets the milk and not the child's mother who, anxious to get away from the Clinic in a hurry, assists her slow drinking child with its milk ration. Thus, under the old Ward conditions and in our Clinics, if a child failed to improve in spite of the fact that it managed to consume all the milk and meat we gave it, we always suspected that someone else was helping to eat the child's food and that it was not, in fact, getting the amount we considered it needed.

I do not think that there was anything wrong with our choice of protein, but I do think that the quantity the patients received was not always sufficient.

One other factor contributed to this, the progressive anorexia from which so many of our fatal cases suffered; and this, I think, was a major factor in influencing the outcome of treatment.

A study of my cases will shew that since gastric feeding was almost always impossible for us, anorexia contributed materially to the death of cases Nos. 2, 3, 4, 7, 9 (on readmission), 11, 15, 16, 20, 21, 23, 25, 26, 29, 31 and 41. In Case No. 30, anorexia steadily increased as the patient's condition deteriorated, and then suddenly began to improve. This improvement in her appetite led to her complete recovery. What caused her appetite to improve I have yet to discover, it was certainly not due to anything we did.

Various measures were tried in an effort to combat anorexia and improve appetite. Food was given in very small amounts. Intramuscular injections of a Vitamin B. Complex preparation were tried as were intramuscular injections of Riboflavin 10 mgms. daily, (see Cases. Nos. 29, 40 and 41), but all were equally unsuccessful.

(c) The Role of Vitamins.

Trowell[8] condemns the use of Vitamin preparations in the treatment of malignant malnutrition. Altmann[7] treated a few cases with hydrolysed protein plus Vitamin B. Complex and states that the results were no worse than those in his published series. (80% recoveries.) I have no great conviction that the Vitamin B. Complex is a necessary adjuvant to treatment with milk and meat. On some occasions I have thought that it helped and on others I have been sure that it didn't. It is certainly useful in all mild cases of malnutrition and tends to improve appetite. In malignant malnutrition I have used it because I thought it might help and am not prepared to say that it failed to do so in every case. It certainly did nothing to combat anorexia and is probably completely unnecessary in the treatment of Kwashiorkor. To say that it is actually harmful though appears to be untrue, particularly in view of Altmann's experience to which reference has already been made.

(d) The Possibility of Irreversible Changes.

At first I was very reluctant to consider that any case of malignant malnutrition was incurable and tried to explain away my failures by the argument that these patients had died because anorexia made it impossible to give them the necessary treatment, except by gastric feeding and other measures not possible under our old Ward conditions.

In Case No. 39, feeding by tube seemed to shew promise and certainly tided the patient over a very critical period and we had high hopes that under our new Ward conditions we should be more successful in our treatment. This, however, has not proved to be the case.

In the seriously ill, we have now tried intratibial serum, whole blood transfusion, feeding by gastric tube with milk, milk plus raw eggs, and a carefully prepared mixture containing equal quantities of casein and protein hydrolysates plus raw eggs and glucose. The treatments were carried out with and without injections of Vitamin B. Complex, and all were completely unsuccessful; at the best they prolonged life while the patient's condition continued to deteriorate very slowly. In the case of two patients fed by tube at 2 hourly intervals with small quantities of our hydrolysate preparation for ten consecutive days, increased lethargy was noted and at post mortem gross oedema of the brain was found, as well as an extremely fatty liver.

On examining the photomicrographs of the livers of Cases. No. 1, 3, 4, 7, 14, 20, 24 and 29, one is immediately impressed by the wholesale changes which have taken place so that it is not difficult to imagine that these changes are irreversible, and that there is not enough normally functioning liver tissue remaining to make use of any protein that might reach it.

I now incline to the view that no matter what we do, cases such as these are beyond aid.

I should very much have liked to try Dr. Altmann's treatment at Luanshya. Unfortunately, however, the Purchasing Department of our Company had to admit defeat in their efforts to procure powdered skimmed milk for me. They tried South Africa, the United Kingdom, the Continent of Europe, Canada and the United States of America, before finally giving up. Should this product become as readily available as Dr. Altmann found it, I certainly intend using it here.

In the meantime, however, I feel that the treatment of malignant malnutrition lies in its prevention rather than its cure. Because of this we now make a practice of regarding gastro-enteritis in a young child as a very serious condition and proceed to give extra protein containing foods to such children as soon as the diarrhoea has been controlled. We cannot afford to feed every child that comes to see us, but we repeatedly warn their parents of the consequences of bad feeding and endeavour to instruct them in hygiene and dietetics.

S U M M A R Y .

1. Forty-four cases of malignant malnutrition are presented, and the incidence, aetiology, symptomology, pathology and treatment discussed.

2. The dietetic habits of the African population of Luanshya are described and the inference drawn that practically every African child here under the age of three years is suffering from malnutrition due to a low protein high carbohydrate diet.

3. The onset of malignant malnutrition is held to be due to the increased body demands resulting from debilitating illnesses and infections upon such undernourished children; recurring attacks of gastro-enteritis being the most dangerous of these illnesses.

4. In spite of adequate treatment with easily assimilable proteins, a high mortality rate is to be expected in dealing with frank kwashiorkor.

5. Anorexia is the most dangerous and troublesome symptom.

6. Prophylaxis is most important, and simple instruction in dietetics and hygiene is as much part of a campaign to prevent malignant malnutrition as is the provision of protein containing foods.

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A C K N O W L E D G E M E N T S.

My thanks are due to Dr. A. C. Fisher, Chief Medical Officer of the Roan Antelope Copper Mines, Ltd., for his ready encouragement and advice at all times; and to Mr. W. G. Tarrant, our Laboratory Technician, for the preparation of my microscopical sections, and for the extra laboratory work he has so willingly undertaken. Finally, I must thank my Clinic and Ward Sisters for the cheerful way they have carried out my suggestions and ideas, even though these have meant much extra work for them.

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